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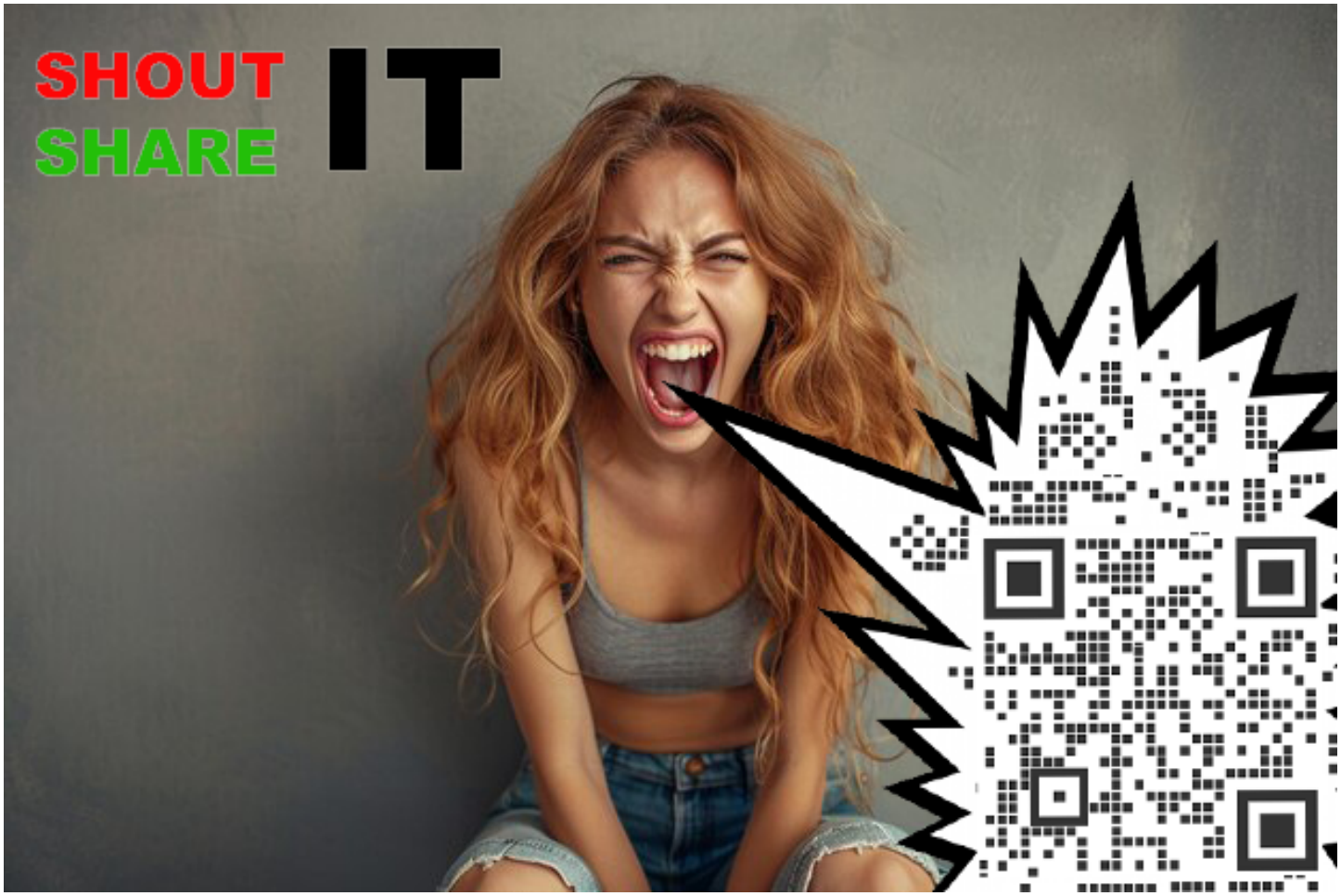
Global Forest Resources Assessment 2005

Progress towards sustainable forest management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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2006

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Contents

Acknowledgements ix
Foreword x
Acronyms and abbreviations xi
Executive summary xii

Chapter 1. Introduction 1
The reporting framework 2
The process 6

Chapter 2. Extent of forest resources 11
Overview 11
Key findings 12
Forest area and forest area change 14
Forest characteristics 23
Growing stock 30
Biomass and carbon 31

Chapter 3. Biological diversity 37
Overview 37
Key findings 38
Primary forests 40
Forest area designated for conservation of biodiversity 43
Composition of forests 47
Number of native tree species 51
Threatened forest tree species 53

Chapter 4. Forest health and vitality 57
Overview 57
Key findings 59
Forest fires 60
Insects and diseases 65
Other disturbances 68

Chapter 5. Productive functions of forest resources 75
Overview 75
Key findings 76
Forest area designated for productive purposes 77
Productive forest plantations 80
Growing stock and commercial growing stock 83
Removals of wood products 88
Removals of non-wood forest products 91

Chapter 6. Protective functions of forest resources 95
Overview 95
Key findings 98

Forest area designated for protective purposes 99
Protective forest plantations 103

Chapter 7. Socio-economic functions 107
Overview 107
Key findings 108
Value of wood removals 109
Value of NWFP removals 113
Employment 116
Ownership of forests and other wooded lands 119
Forest area designated for social services 124

Chapter 8. Progress towards sustainable forest management 129
Methodology 129
Results 132
Discussion 143

Chapter 9. Conclusions 149
Progress towards sustainable forest management 149
Scope and coverage of FRA 2005 150
FRA 2005 process 153
Concluding remarks 153
Next steps 154

Bibliography 155

Annexes
Annex 1. Contributors 161
Annex 2. Terms and definitions for national reporting tables for FRA 2005 169
Annex 3. Global tables 177
Annex 4. FRA 2005 working papers 311
Annex 5. FRA 2005 meetings and workshops 313
Annex 6. Earlier global assessments 315

Tables

1.1 FRA 2005 reporting tables 5
1.2 Indicative linkages between reporting tables and thematic elements of sustainable forest management 5
1.3 Key statistics for regions and subregions used in FRA 2005 6

2.1 Distribution of forests by subregion 2005 16
2.2 High forest cover countries 2005 17
2.3 Forest cover by subregion 2005 18
2.4 Annual changes in forest area by subregion 1990–2005 20
2.5 Ten countries with largest annual net loss in forest area 2000–2005 21
2.6 Ten countries with largest annual net gain in forest area 2000–2005 21
2.7 Comparison of forest area estimates in FRA 2005 and FRA 2000 23
2.8 Carbon stock per hectare 2005 34
2.9 Average factors for estimating biomass and carbon from growing stock 34
2.10 Trends in carbon stocks in forest biomass 1990–2005 36

3.1 Area of primary forest 2005 41
3.2 Ten countries with highest percentage of primary forest 2005 42
3.3 Area of forest designated primarily for conservation of biodiversity 2005 45
3.4 Total area of forest designated for conservation of biodiversity 2005 46
3.5 Trends in area of forest designated primarily for conservation of biodiversity 1990–2005 46
3.6 Trends in total area of forest designated for conservation of biodiversity 1990–2005 47
3.7 Percentage of growing stock occupied by the most common tree species 2000 48
3.8 Native forest tree species 52
3.9 Threatened tree species 54
3.10 Threatened tree species as percentage of number of native tree species in individual countries 55

4.1 Average area of forest annually affected by fire 1998–2002 64
4.2 Trends in area of forest annually affected by fire 1988–1992 and 1998–2002 64
4.3 Average area of forest annually affected by insects 1998–2002 69
4.4 Average area of forest annually affected by diseases 1998–2002 69
4.5 Trends in area of forest annually affected by diseases 1988–1992 and 1998–2002 70
4.6 Trends in area of forest annually affected by insects 1988–1992 and 1998–2002 70
4.7 Average area of forest annually affected by other disturbances 1998–2002 72
4.8 Trends in area of forest annually affected by other disturbances 1988–1992 and 1998–2002 73

5.1 Area of forest designated primarily for production 2005 79
5.2 Trends in area of forest designated primarily for production 1990–2005 79

5.3 Area of productive forest plantations 2005 81
5.4 Trends in area of productive forest plantations 1990–2005 82
5.5 Ten countries with largest area of productive forest plantations 1990–2005 83
5.6 Ten countries with greatest annual increase in productive forest plantation area 1990–2005 83
5.7 Forest area and growing stock 2005 85
5.8 Commercial growing stock 2005 86
5.9 Trends in growing stock and growing stock per hectare 1990–2005 87
5.10 Trends in commercial growing stock 1990–2005 88
5.11 Wood removals 2005 90
5.12 Trends in wood removals 1990–2005 91
5.13 Removals of four categories of NWFPs (plant products) 2005 93
5.14 Annual changes for four categories of NWFPs (plant products) per region 1990–2005 94

6.1 Protected area categories and management objectives 98
6.2 Area of forest designated primarily for protection 2005 101
6.3 Total area of forest designated for protection 2005 102
6.4 Trends in area of forest designated primarily for protection 1990–2005 102
6.5 Area of protective forest plantations 2005 104
6.6 Trends in area of protective forest plantations 1990–2005 105
6.7 Ten countries with largest area of protective forest plantations 1990–2005 106

7.1 Proportion of roundwood production in value of wood removals 2005 110
7.2 Value of wood removals 2005 112
7.3 Trends in value of wood removals 1990–2005 112
7.4 Value of NWFP removals 2005 115
7.5 Reported values of total NWFP removals 1990–2005 116
7.6 Number of people employed in forestry in 2000 118
7.7 Trends in number of people employed in forestry 1990–2000 119
7.8 Ownership of forest area 2000 122
7.9 Trends in ownership of forest area 1990–2000 124
7.10 Area of forest designated primarily for social services 2005 126
7.11 Total area of forest designated for social services 2005 127
7.12 Trends in area of forest designated primarily for social services 1990–2005 127

8.1 List of variables selected for synthesis assessment by thematic area 130
8.2 Trends towards sustainable forest management at the global level 132
8.3 Trends towards sustainable forest management in Africa 134
8.4 Trends towards sustainable forest management in Asia 136
8.5 Trends towards sustainable forest management in Europe 137
8.6 Trends towards sustainable forest management in North and Central America 139
8.7 Trends towards sustainable forest management in Oceania 141
8.8 Trends towards sustainable forest management in South America 142
8.9 Trends towards sustainable forest management by subregion 144

Figures

1.1 Regional and subregional breakdown used in FRA 2005 7
1.2 FRA 2005 Timeline 7

2.1 Information availability – extent of forest resources 12
2.2 The world's forests 15
2.3 Ten countries with largest forest area 2005 16
2.4 Forest area in percent of land area by country 2005 17
2.5 Forest change dynamics 18
2.6 Annual net change in forest area by region 1990–2005 20
2.7 Countries with large net changes in forest area 2000–2005 21
2.8 Information availability – forest characteristics 25
2.9 Forest characteristics 2005 27
2.10 Global trends in forest characteristics 1990–2005 27
2.11 Information availability – carbon stock in forest biomass 33
2.12 Total carbon stock in forests by region 2005 35

3.1 Information availability – biological diversity 38
3.2 Information availability – area of primary forest 41
3.3 Ten countries with largest area of primary forest 2005 42
3.4 Information availability – area of forest designated primarily for conservation of biodiversity 44
3.5 Information availability – total area of forest designated for conservation of biodiversity 44
3.6 Information availability – composition of growing stock 48
3.7 Average growing stock of the ten most common forest tree species as function of growing stock occupied by the three most common species 49
3.8 Percentage of growing stock represented by the three most common forest tree species as function of number of native species 50
3.9 Twenty-five most common tree genera reported 50
3.10 Information availability – number of native forest tree species 51
3.11 Number of native forest tree species 52
3.12 Information availability – threatened forest tree species 54
3.13 Average number of threatened forest tree species by region 55

4.1 Information availability – forest health and vitality 59
4.2 Information availability – forest fires 63
4.3 Information availability – forest insect pests 67
4.4 Information availability – diseases 67
4.5 Information availability – other disturbances 71

5.1 Information availability – productive functions of forest resources 75
5.2 Information availability – area of forest designated primarily for production 78
5.3 Information availability – total area of forest designated for production 78
5.4 Information availability – area of productive forest plantations 80

5.5 Ten countries with largest area of productive forest plantations 2005 82
5.6 Information availability – growing stock 84
5.7 Information availability – commercial growing stock 84
5.8 Five countries with greatest total growing stock 2005 86
5.9 Information availability – wood removals 89
5.10 Five countries with largest volume of wood removals 2005 90
5.11 Information availability – NWFP removals 92
5.12 Information availability – NWFP removals by product category 93

6.1 Information availability – protective functions of forest resources 98
6.2 Information availability – area of forest designated primarily for protection 100
6.3 Information availability – total area of forest designated for protection 101
6.4 Area of forest designated primarily for protection 1990–2005 103
6.5 Information availability – area of protective forest plantations 104
6.6 Ten countries with largest area of protective forest plantations 2005 105

7.1 Information availability – socio-economic functions 108
7.2 Information availability – value of wood removals 110
7.3 Information availability – value of NWFP removals 114
7.4 Information availability – value of NWFP removals by product category 114
7.5 Information availability – employment 117
7.6 Information availability – ownership 122
7.7 Ownership of forests by subregion 2000 123
7.8 Information availability – area of forest designated primarily for social services 126

8.1 Designated functions of forests globally 2005 129
8.2 Distribution of subregional trends 146

9.1 Information availability – reporting tables in relation to global forest area 151

Boxes

1.1 Thematic elements of sustainable forest management 3

2.1 FRA 2005 thematic study on planted forests 24
2.2 FRA 2005 thematic study on mangroves 28
2.3 FRA 2005 thematic study on bamboo 29

4.1 FRA 2005 thematic study on forest fires 61
4.2 FRA 2005 thematic study on forest pests 68

6.1 FRA 2005 thematic study on forests and water 96

7.1 FRA 2005 thematic study on forest ownership and resource tenure 120

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FAO is grateful for the support of all countries, organizations and experts inside and outside the organization that have made FRA 2005 possible.

Institutional and individual contributors to FRA 2005 are listed in Annex 1. Editing and production of the report were managed by Lynn Ball, and formatting and layout were done by Flora Dicarlo.

Foreword

We have high expectations of the world's forest resources. They are to provide renewable raw materials and energy, maintain biological diversity, mitigate climate change, protect land and water resources, provide recreation facilities, improve air quality and help alleviate poverty. At the same time, forests are affected by fire, air pollution, pests and invasive species, and are the primary targets in many countries for agricultural and urban expansion. Competing interests in the benefits of forest resources and forest land are omnipresent, and the need for a sound basis for analysis and conflict resolution has never been greater.

The process of global forest resources assessment (FRA) has responded to this challenge. By adopting the concept of sustainable forest management as a reporting framework, FRA is now well placed to provide a holistic perspective on global forest resources, their management and uses. Beyond the conventional production and environmental dimensions of forestry, FRA now includes parameters that are important to forest dwellers and rural poor people, such as the value of non-wood forest products and trends in fuelwood removals. By addressing the thematic elements of sustainable forest management, FRA has evolved into an instrument that is indispensible in international negotiations and arrangements related to forests, and for clarifying the relationship of forestry to sustainable development.

It is through the participation of national experts from virtually all countries that the FRA process ensures that the best and most recent knowledge is applied and that a viable feedback mechanism to national policy processes is in place. The data for FRA 2005 were delivered by national correspondents – nominated by the countries – and their networks of professionals. FAO's role has been to coordinate the process and synthesize this information.

The immediate application of report findings and the associated databases will be in international arrangements addressing biological diversity, climate change, desertification, criteria and indicators for sustainable forest management, environmental outlook studies and the Millennium Development Goals, among others. I trust that these processes will not only make good use of this new knowledge, but will also generate feedback so that FRA can evolve, responding to new information requirements and continually improving global knowledge of forest resources.

Finally, the question that has frequently been asked: are we progressing towards sustainable forest management? This is the question that constituted the base of FRA 2005. Surprisingly, the answer cannot be a definitive one: there are many good signs and positive trends, but many negative trends remain. While intensive forest plantation and conservation efforts are on the rise, primary forests continue to become degraded or converted to agriculture at alarming rates in some regions. As the report also shows, there is a worrying correlation between negative forest resource trends and the size of rural poor populations, which calls for an intensified effort to understand and address the interrelationships of agriculture, forestry and poverty – which could be the overriding theme of a future FRA.

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Acronyms and abbreviations

CBD	Convention on Biological Diversity
COFO	Committee on Forestry (FAO)
CPF	Collaborative Partnership on Forests
DBH	diameter at breast height
ECOSOC	Economic and Social Council (UN)
FORIS	Forestry Information System (FAO)
FRA	Global Forest Resources Assessment
GBA-2000	Global Burnt Area 2000 Project
GDP	gross domestic product
GFMC	Global Fire Monitoring Center
IFF	Intergovernmental Forum on Forests
INBAR	International Network for Bamboo and Rattan
IPCC	Intergovernmental Panel on Climate Change
IPF	Ad Hoc Intergovernmental Panel on Forests
IPPC	International Plant Protection Convention
ISDR	International Strategy for Disaster Reduction (UN)
ISPM	International Standards for Phytosanitary Measures
ITTO	International Tropical Timber Organization
IUCN	World Conservation Union
LFCC	low forest cover countries
MCPFE	Ministerial Conference on the Protection of Forests in Europe
MEA	Millennium Ecosystem Assessment
NWFP	non-wood forest product
SIDS	small island developing states
UNCED	United Nations Conference on Environment and Development
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFF	United Nations Forum on Forests
WCMC	World Conservation Monitoring Centre
WDPA	World Database on Protected Areas
WRI	World Resources Institute
WWF	World Wide Fund for Nature

Executive Summary

FAO has been coordinating global forest resources assessments every five to ten years since 1946. The Global Forest Resources Assessment 2005 (FRA 2005) is the most comprehensive to date. More than 800 people have been involved, including 172 national correspondents and their teams, an advisory group, international experts, FAO and UNECE staff, consultants and volunteers from around the world.

Information was collected and analysed from 229 countries and areas for three points in time: 1990, 2000 and 2005. FAO worked closely with countries and specialists in the design and implementation of FRA 2005 – through regular contact, expert consultations, training for national correspondents and ten regional and subregional workshops. A truly global partnership, resulting in improved knowledge of the world's forests and forestry, a more transparent reporting process and enhanced capacity in data analysis and reporting.

FRA 2005 examines current status and recent trends for about 40 variables, covering the extent, condition, uses and values of forests and other wooded land, with the aim of assessing all benefits from forest resources. In the main section of this report, results are presented according to six themes representing important elements of sustainable forest management:

- Extent of forest resources
- Biological diversity
- Forest health and vitality
- Productive functions of forest resources
- Protective functions of forest resources
- Socio-economic functions

A summary of key findings is presented below, followed by a section attempting to answer the following question:

> What does the information contained in FRA 2005 tell us about progress towards sustainable forest management since 1990 on regional and global scales?

KEY FINDINGS

Forests cover 30% of the total land area

Total forest area in 2005 is just under 4 billion hectares (ha), corresponding to an average of 0.62 ha per capita (Figure 1). However, the area of forest is unevenly distributed. For example, 64 countries with a combined population of 2 billion have less than 0.1 ha of forest per capita. The ten most forest-rich countries account for two-thirds of total forest area (Figure 2). Seven countries or areas have no forest at all, and an additional 57 have forest on less than 10 percent of their total land area.

Total forest area continues to decrease – but the rate of net loss is slowing

Deforestation, mainly conversion of forests to agricultural land, continues at an alarmingly high rate – about 13 million hectares per year (Box 1). At the same time, forest planting, landscape restoration and natural expansion of forests have significantly reduced the net loss of forest area. Net change in forest area in the period 2000–2005 is estimated at -7.3 million hectares per year (an area about the size of Sierra Leone or Panama), down from -8.9 million hectares per year in the period 1990–2000.

South America suffered the largest net loss of forests from 2000 to 2005 – about 4.3 million hectares per year – followed by Africa, which lost 4.0 million hectares annually (Figure 4).

North and Central America and Oceania each had a net loss of about 350 000 ha, while Asia, which had a net loss of some 800 000 ha per year in the 1990s, reported a net gain of 1 million hectares per year from 2000 to 2005, primarily as a result of large-scale

FIGURE 1
The world's forests

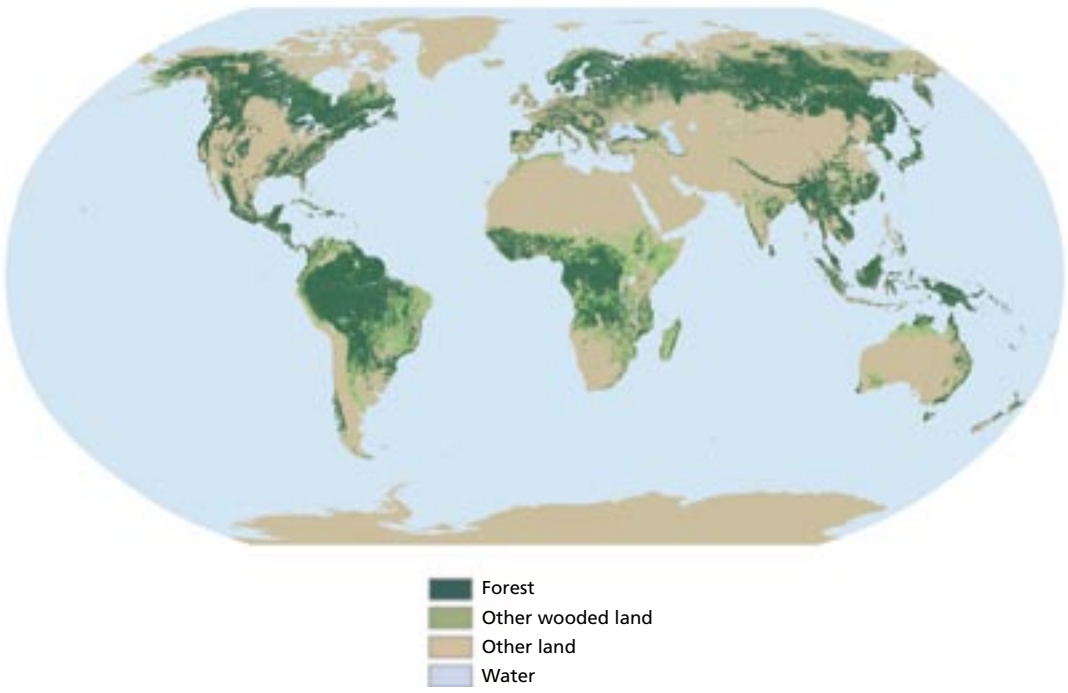
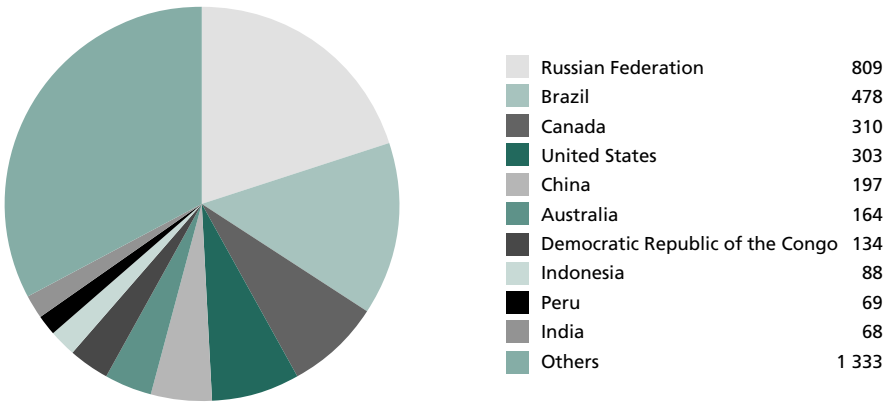


FIGURE 2
Ten countries with largest forest area 2005
(million ha)



afforestation reported by China. Forest areas in Europe continued to expand, although at a slower rate than in the 1990s. Countries with large net changes in forest area during 2000–2005 are highlighted in Figure 5.

Primary forests account for 36% of forest area – but 6 million hectares are lost or modified each year

Globally, more than one-third of all forests are primary forests (i.e. forests of native species, in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed) (Figure 6). About 6 million hectares of these were lost or modified each year since 1990, and there is no indication that the rate of

BOX 1

Deforestation and net change in forest area

Figure 3 is a simplified model illustrating forest change dynamics. It has only two classes: forests and all other land. A *reduction* in forest area can happen through either of two processes. Deforestation, which is by far the most important, implies that forests are cleared by people and the land converted to other uses, such as agriculture or infrastructure. Natural disasters may also destroy forests. When the area is incapable of regenerating naturally and no efforts are made to replant it, it, too, reverts to other land.

An *increase* in forest area can also happen in two ways: either through afforestation, i.e. planting of trees on land that was not previously forested, or through natural expansion of forests, e.g. on abandoned agricultural land – which is quite common in some European countries.

Where part of a forest is cut down but replanted (reforestation), or where the forest grows back on its own within a relatively short period (natural regeneration), there is no change in forest area.

For FRA 2005, countries were asked to provide information on their forest area for three points in time. This allows calculation of the net change in forest area over time. This net change is the sum of all negative changes due to deforestation and natural disasters and all positive changes due to afforestation and natural expansion of forests.

Countries were not requested to provide information on each of the four components of net change, as most countries do not have such information. This makes estimation of the deforestation rate difficult and no attempt has been made to do so at the country level. Rather, an estimate of the global deforestation rate has been made as follows:

The total net loss for countries with a negative change in forest area was 13.1 million hectares per year for 1990–2000 and 12.9 million hectares per year for 2000–2005. Since the net change rate takes into account afforestation efforts and natural expansion of forests, the rate of deforestation might be higher still. On the other hand, Brazil, which accounts for 21 percent of the total net loss in the period 1990–2000 and 24 percent in 2000–2005, calculated its forest area in 2005 and 1990 based on information from 2000 and the sum of annual figures of the area of forests cleared. It did not take into account to what extent the land use of these areas had changed and to what extent cleared lands had been abandoned and had reverted to forest through natural regeneration. Such naturally regenerated secondary forests are thought to be quite extensive, but insufficient information is currently available to estimate the extent. Thus the area of deforestation and the net loss of forests in Brazil are likely overestimated.

Taking these considerations into account, the global deforestation rate was estimated at 13 million hectares per year during the period 1990–2005, with few signs of a significant decrease over time.

FIGURE 3

Forest change dynamics

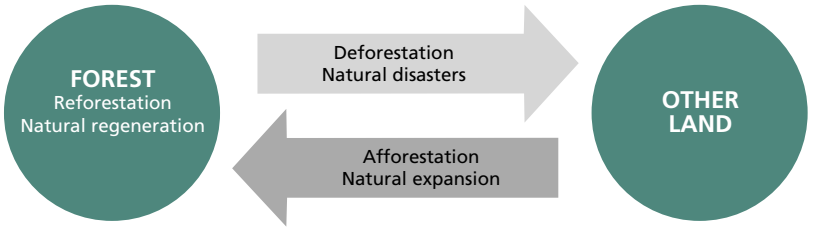


FIGURE 4
Annual net change in forest area by region 1990–2005
(million ha per year)

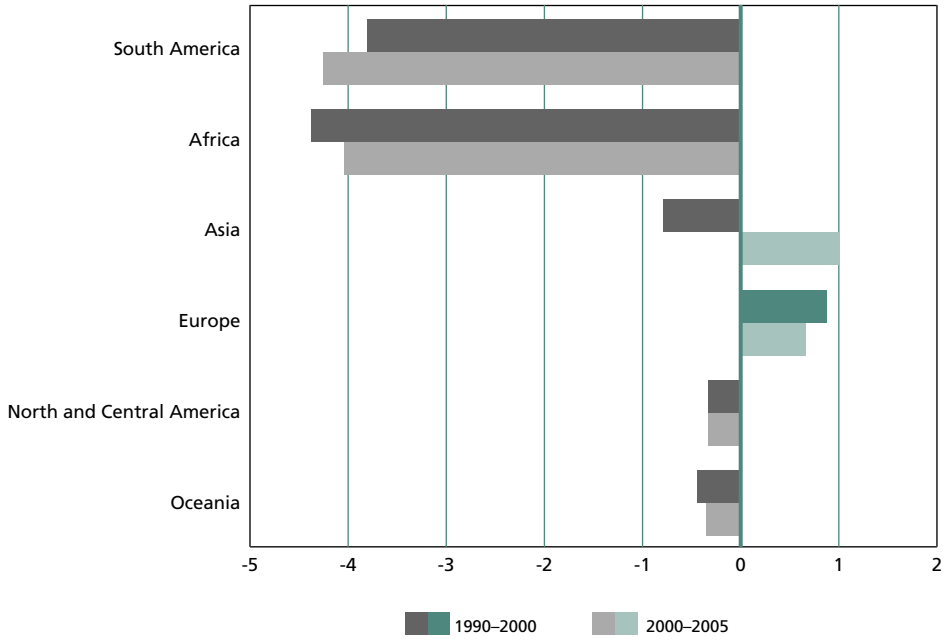
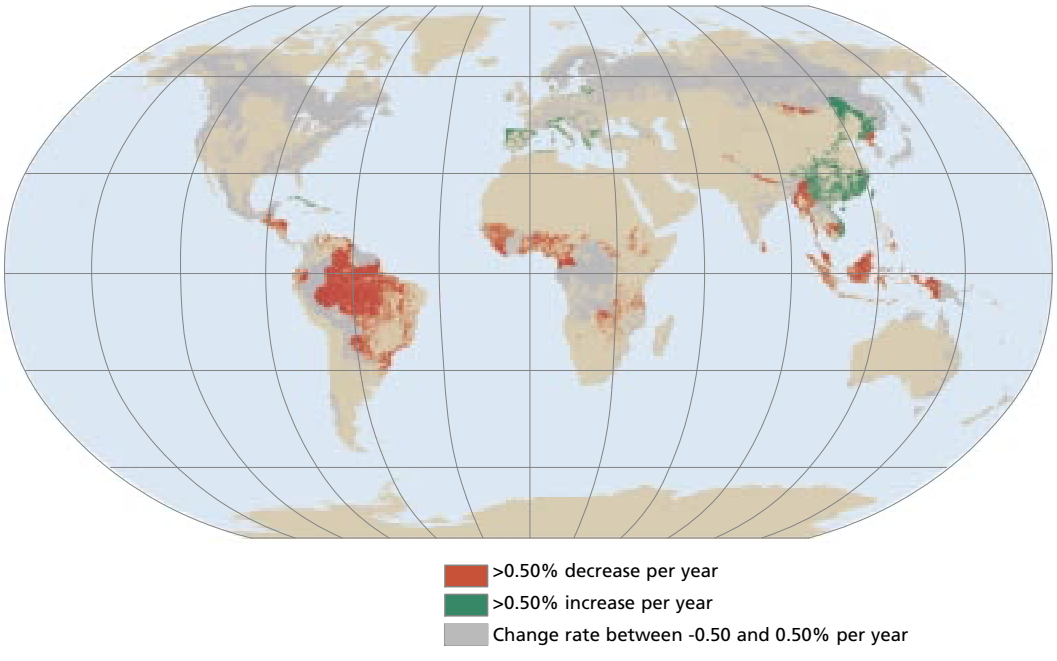


FIGURE 5
Countries with large net changes in forest area 2000–2005



BOX 2

Previous figures slightly underestimated total forest area and overestimated net annual loss

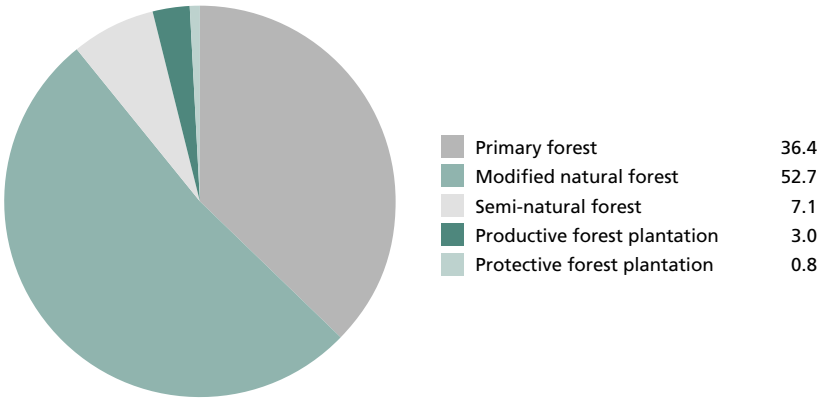
For FRA 2005, countries were asked to provide information on their forests for three points in time: 1990, 2000 and 2005. Total forest area figures for 1990 and 2000, revised to take new information provided to FRA 2005 into account, are about 3 percent higher than those estimated in FRA 2000.

Similarly, the net area change for 1990–2000 was revised downwards because of new information (from -9.4 million hectares per year to -8.9 million).

FIGURE 6

Forest characteristics 2005

(%)



change is slowing down. This rapid decrease stems not only from deforestation, but also from modification of forests due to selective logging and other human interventions through which primary forests move into the category of modified natural forests.

A number of countries registered positive change rates in the area of primary forests, including several European countries and Japan. This is possible because, in the absence of human intervention, forests can evolve over time to meet the above definition of primary forests.

Forest plantations are increasing – but still account for less than 5% of total forest area

Forests and trees are being planted for many purposes and at increasing rates (Figure 7). Forest plantations – a subset of planted forests consisting primarily of introduced species – make up an estimated 3.8 percent of total forest area, or 140 million hectares. Productive forest plantations, primarily established for wood and fibre production, account for 78 percent of forest plantations, and protective forest plantations, primarily established for conservation of soil and water, for 22 percent. The area of forest plantations has increased by about 2.8 million hectares per year in the period 2000–2005, 87 percent of which are productive forest plantations.

Forests – a vital carbon sink

While deforestation, degradation and poor forest management reduce carbon storage in forests, sustainable management, planting and rehabilitation of forests can increase carbon sequestration. It is estimated that the world's forests store 283 gigatonnes (Gt) of

carbon in their biomass alone, and that the carbon stored in forest biomass, dead wood, litter and soil together is more than the amount of carbon in the atmosphere.

Carbon in forest biomass decreased in Africa, Asia and South America in the period 1990–2005, but increased in all other regions (Figure 8). For the world as a whole, carbon stocks in forest biomass decreased by 1.1 Gt of carbon annually, owing to continued deforestation and forest degradation, partly offset by forest expansion (including planting) and an increase in growing stock per hectare in some regions.

FIGURE 7
Changes in forest plantation area 1990–2005
(million ha)

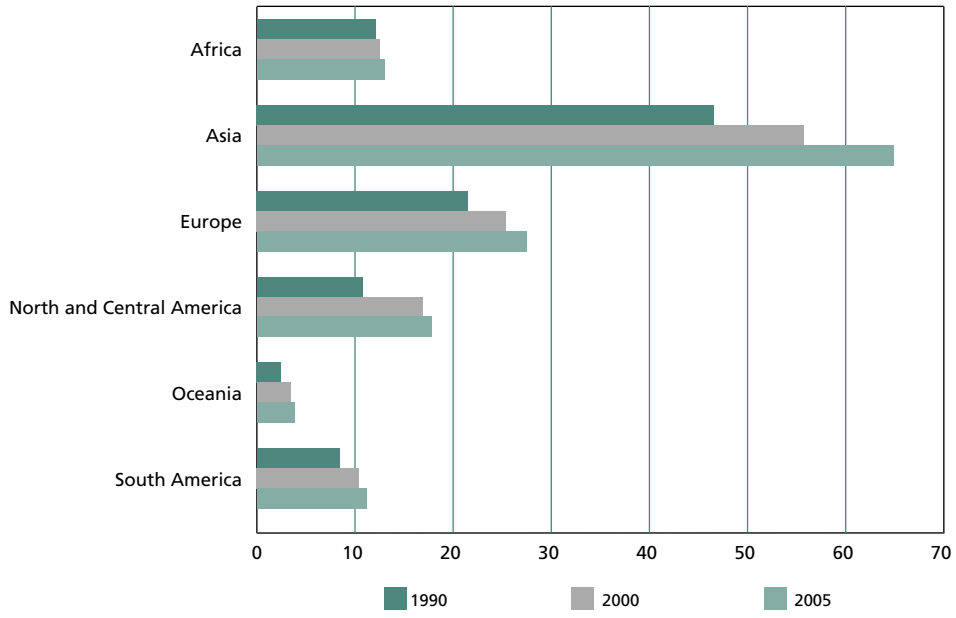
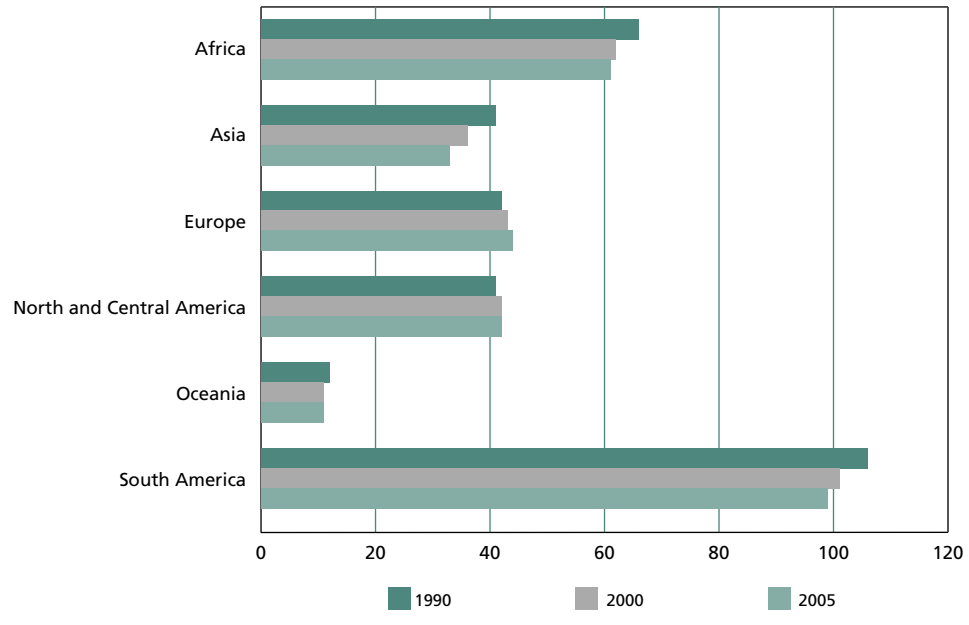


FIGURE 8
Changes in carbon stocks in forest biomass 1990–2005
(Gt)



Wide variation in number of native tree species – from 3 in Iceland and in Malta to 7 780 in Brazil

Despite the large number of native tree species in many countries, relatively few species account for most of the standing wood volume. In most regions and subregions, the ten most common tree species (by volume) account for more than 50 percent of total wood volume. Exceptions are Central America, South America, South and Southeast Asia and Western and Central Africa, where the tree species diversity is particularly high (Figure 9).

Rare tree species and those highly valued for wood or non-wood forest products are often in danger of becoming extinct within parts of their range. On average, 5 percent of the tree species native to a country are either vulnerable, endangered or critically endangered.

Forest disturbances can be devastating – but they were severely underreported

On average, 104 million hectares of forest were reported to be significantly affected each year by forest fire, pests (insects and disease) or climatic events such as drought, wind, snow, ice and floods. However, the area of forest affected by disturbances was severely underreported, with information missing from many countries, especially for forest fires in Africa.

84% of the world's forests are publicly owned – but private ownership is increasing

Trends seen over the past 20 years towards community empowerment, decentralized decision-making and increased involvement of the private sector in forest management are reflected in some regions in changes in forest ownership and tenure. However, most of the world's forests remain under public ownership (Figure 10). Differences among regions are considerable. North and Central America, Europe (apart from the Russian Federation), South America and Oceania have a higher proportion of private ownership than other regions.

FIGURE 9
Number of native forest tree species

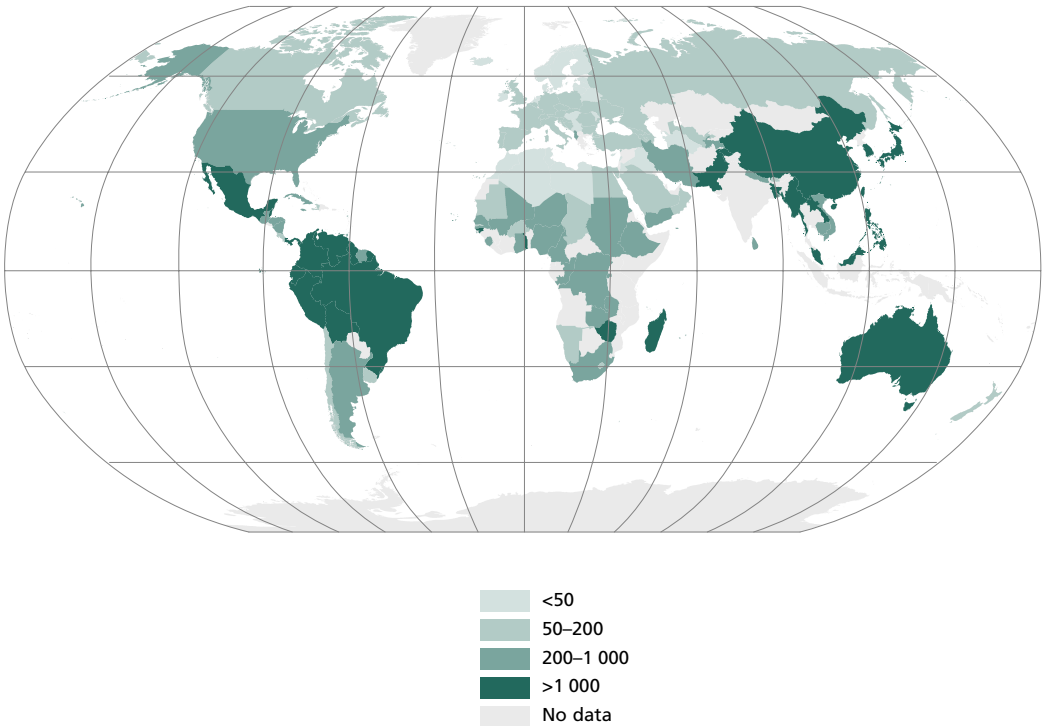
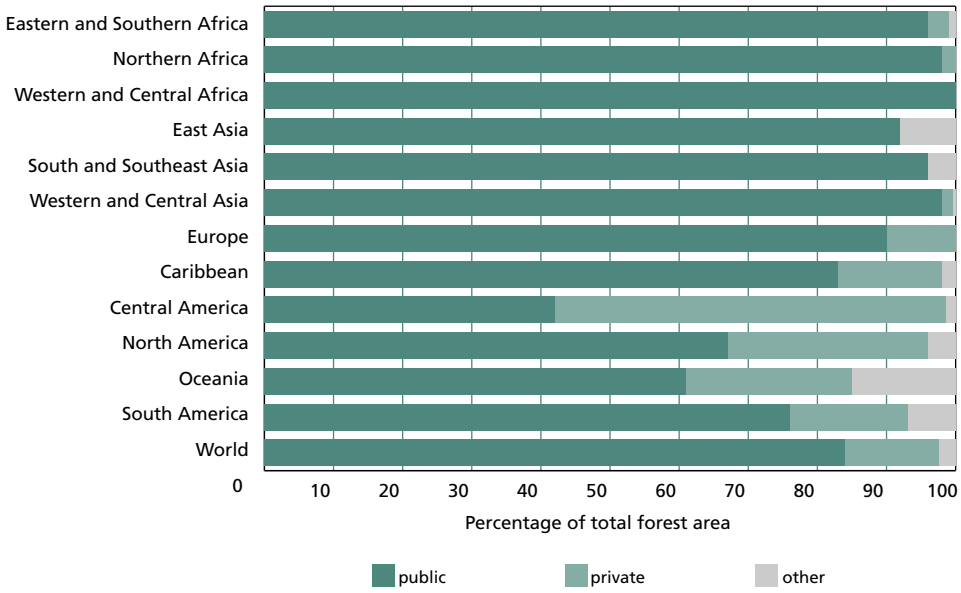


FIGURE 10
Ownership of forests by subregion 2000



Forest management

Forests are increasingly being managed for a variety of uses and values, often in combination (Figure 11).

11% of the world's forests are designated for the conservation of biological diversity

For FRA 2005, countries reported on the area of forest in which conservation of biological diversity was designated as the primary function (Figure 12). This area has increased by an estimated 96 million hectares since 1990 and now accounts for 11 percent of total forest area. These forests are mainly, but not exclusively, located within protected areas. Conservation of biological diversity was reported as one of the management objectives (primary or secondary) for more than 25 percent of the forest area.

One-third of the world's forests are used primarily for production of wood and non-wood forest products

Wood production continues to be an important function of many forests, and reported removals of non-wood forest products (NWFPs) are on the rise. Production of wood and non-wood forest products is the primary function for 34 percent of the world's forests, while more than half of all forests are used for such production in combination with other functions, such as soil and water protection, biodiversity conservation and recreation.

Global wood removals were forecast to amount to 3 billion m^3 in 2005, similar to the total removals recorded for 1990 and averaging 0.69 percent of total growing stock. While Asia reported a decrease in wood removals in recent years, Africa reported a steady increase (Figure 13). It is estimated that nearly half of the removed wood was fuelwood. Informally or illegally removed wood, especially fuelwood, is not usually recorded, so the actual amount of wood removals is undoubtedly higher.

More than 300 million hectares of forests are designated for soil and water conservation

Protective functions of forests range from soil and water conservation and avalanche control to sand-dune stabilization, desertification control and coastal protection. As reported for

FIGURE 11
Designated functions of forests globally 2005
(%)

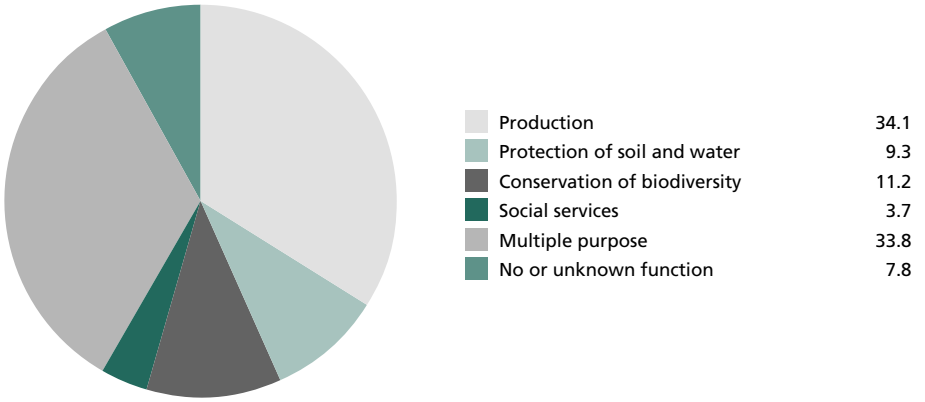
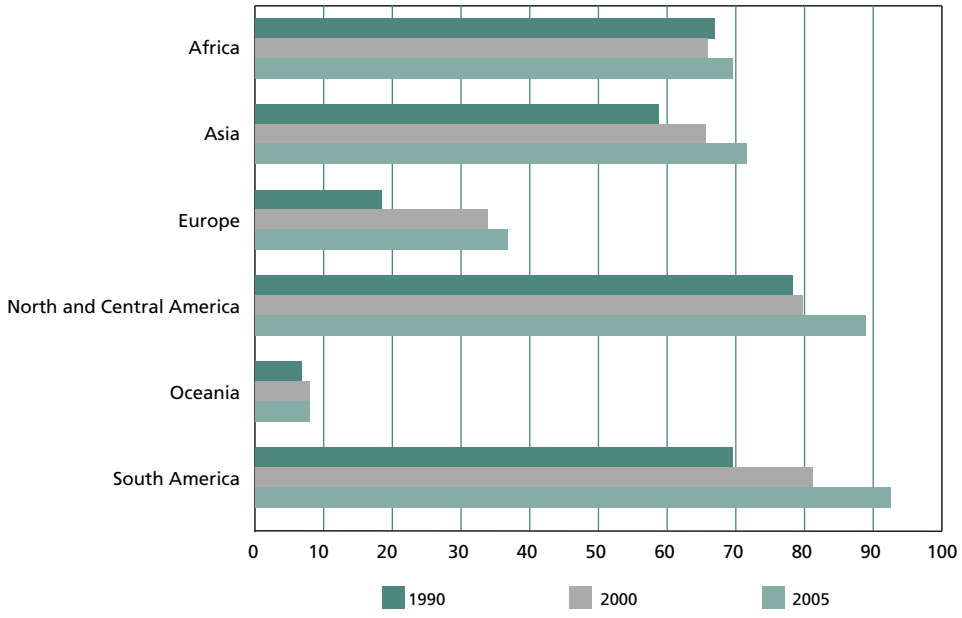


FIGURE 12
Forests designated for conservation 1990–2005
(million ha)

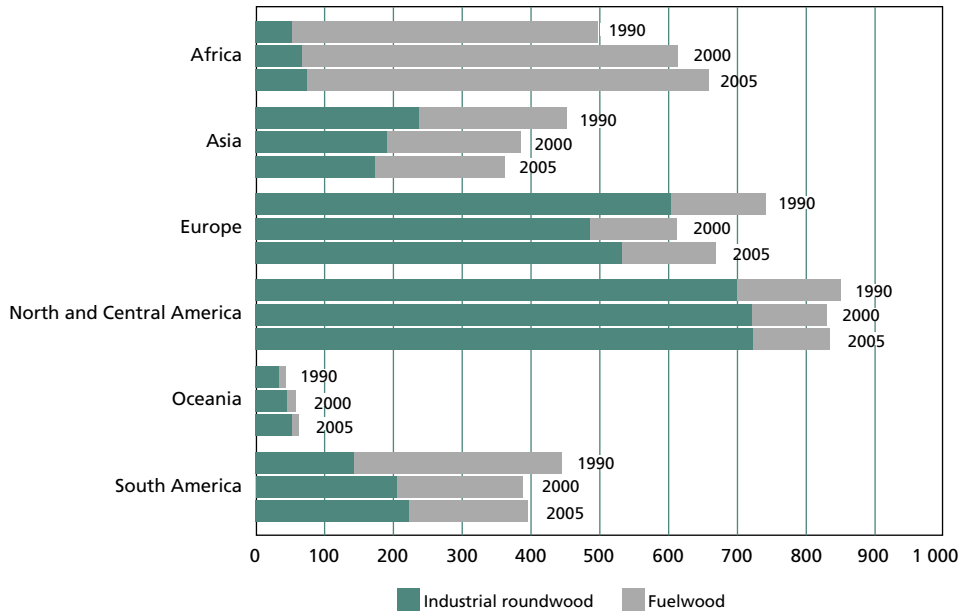


FRA 2005, an estimated 348 million hectares of forests have a protective function as their primary objective. Eighteen countries reported that all their forests are designated for protective purposes, as either a primary or secondary function. The overall proportion of forests designated for protective functions increased from 8 percent in 1990 to 9 percent in 2005.

Use of forests for recreation and education is increasing – but is difficult to quantify

The only region with fairly good data on the use of forests for recreation, tourism, education and conservation of cultural and spiritual sites is Europe, where provision of such social services was reported as the primary management objective for 2.4 percent of total forest area. In all, 72 percent of the forest area of Europe (not including the Russian Federation) provides social services – most frequently in combination with other management objectives.

FIGURE 13
Trends in wood removals 1990–2005
(million m³)



The value of wood removals is decreasing, while the value of NWFPs is increasing – and is underestimated

Roundwood removals in 2005 were estimated at US$64 billion, mainly accounted for by industrial roundwood. The reported trend shows an increase of about 11 percent over the previous 15 years, which is less than the rate of inflation over this period. Thus the reported value of removals in real terms has declined at the global level.

The estimated value of NWFP removals in 2005 is US$4.7 billion. However, information was missing from many countries, and the reported statistics probably cover only a small fraction of the true total value. Edible plant products and bushmeat are the most significant products in terms of value. Trends at global and regional levels generally show a slight increase since 1990.

Some 10 million people are employed in forest conservation and management activities

Reported employment in forestry (excluding the wood processing industry) declined by about 10 percent from 1990 to 2000. Most of the decline occurred in the primary production of goods and can probably be attributed to increases in labour productivity. At the regional level, Asia and Europe showed a downward trend, while in the other regions employment increased somewhat – probably because roundwood production was increasing faster than increases in labour productivity. In Europe, the decline in employment can also be attributed to the restructuring of formerly centrally planned economies.

FRA 2005 collected data on formal employment only. However, some country reports did not separate informal and formal employment, so formal employment could be somewhat less than 10 million people. Taking into account the informal sector, the overall importance of forest employment for rural livelihoods and national economies was clearly higher than this number suggests.

PROGRESS TOWARDS SUSTAINABLE FOREST MANAGEMENT

An analysis based on a subset of 21 variables was undertaken at subregional and regional levels to review progress towards sustainable forest management in the period 1990–2005

(1990–2000 in some cases). The key results globally are summarized below under six main themes and illustrated in Table 1. Table 2 summarizes results at the subregional level. For more information, refer to Chapter 8.

Progress towards sustainable forest management at the global level

Extent of forest resources. Area of forest decreased by an average of 8.4 million hectares per year from 1990 to 2005; the annual change rate is 0.21 percent per year. None of the other variables included under this theme show an annual change rate above 0.50 percent, although they also show a decrease over time.

Biological diversity. Area of primary forest decreased by an average of 5.8 million hectares per year (excluding the Russian Federation, where large changes were due to the introduction of a new classification system). On a positive note, the area of forest designated for conservation of biological diversity increased by about 6.4 million hectares per year – or a total of 96 million hectares during the same period.

Forest health and vitality. The area of forest adversely affected by insects, disease and other disturbances shows an increase equivalent to 1.1 million hectares per year, while the area adversely affected by forest fires shows a small decrease. However, information was missing from many countries, particularly from Africa.

TABLE 1
Trends towards sustainable forest management at the global level

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.21	-8 351	1 000 ha
	Area of other wooded land	M	-0.35	-3 299	1 000 ha
	Growing stock of forests	H	-0.15	-570	million m³
	Carbon stock per hectare in forest biomass	H	-0.02	-0.15	tonnes/ha
Biological diversity	Area of primary forest	H	-0.52	-5 848	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	1.87	6 391	1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.26	-9 397	1 000 ha
Forest health and vitality	Area of forest affected by fire	M	-0.49	-125	1 000 ha
	Area of forest affected by insects, disease and other disturbances	M	1.84	1 101	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	-0.35	-4 552	1 000 ha
	Area of productive forest plantations	H	2.38	2 165	1 000 ha
	Commercial growing stock	H	-0.19	-321	million m³
	Total wood removals	H	-0.11	-3 199	1 000 m³
	Total NWFP removals	M	2.47	143 460	tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	1.06	3 375	1 000 ha
	Area of protective forest plantations	H	1.41	380	1 000 ha
Socio-economic functions	Value of total wood removals	L	0.67	377	million US$
	Value of total NWFP removals	M	0.80	33	million US$
	Total employment	M	-0.97	-102	1 000 pers. yrs
	Area of forest under private ownership	M	0.76	2 737	1 000 ha
	Area of forest designated primarily for social services	H	8.63	6 646	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

Productive functions of forest resources. The most prominent changes over the last 15 years were a decrease in the area of forest designated primarily for productive purposes by an average of 4.6 million hectares per year, and an increase in the area of productive forest plantations of almost 2.2 million hectares per year. This indicates that substantial areas of natural forests previously allocated for productive purposes were designated for other uses, while the proportion of wood removals coming from forest plantations increased significantly.

Protective functions of forest resources. Both variables included under this theme show an increase since 1990. The area of forest primarily designated for protective purposes increased by close to 3.4 million hectares per year or more than 50 million hectares during the last 15 years, indicating an increased awareness of the important role forests play in soil and water conservation, avalanche control, combating desertification and coastal protection.

Socio-economic functions. The total values of removals of wood and non-wood forest products increased, but by less than the average rate of inflation. Employment in forest conservation and management decreased by about 1 percent per year. The area of privately owned forests increased by an average of 2.7 million hectares per year in the period 1990–2000 (2005 data not requested from countries), while the area of forest designated for provision of recreation, education and other social services increased by more than 6.6 million hectares per year – or a total of 100 million hectares since 1990 – primarily due to a large increase in Brazil and partly offset by a much smaller decrease in the Russian Federation due to reclassification.

Conclusions. Overall, the situation at the global level remained relatively stable. Negative trends included decreases in primary forests and in employment, and an increase in the area of forest adversely affected by insects, disease and other disturbances. Positive trends were reported for the area of forest designated for biological diversity and social services, as well as for areas of productive and protective forest plantations, value of wood removals and amount and value of NWFP removals, and area of forest under private ownership.

Progress at regional and subregional levels

Africa. Overall, progress towards sustainable forest management in Africa appears to have been limited during the last fifteen years. There are some indications that net loss of forest area has slowed down and that area of forest designated for conservation of biological diversity has increased slightly. However, the continued, rapid loss of forest area – the largest of any region during this 15-year period – is particularly disconcerting.

Asia. Forest area in Asia is almost the same in 2005 as it was in 1990 (572 million hectares versus 574 – or a decrease of 0.03 percent per year), owing to large-scale afforestation efforts during the last 7-8 years – particularly in China. Forest health deteriorated, but forest fires, pests and disease were still affecting a relatively small proportion of total forest area in Asia. The rapid decrease in the area of primary forest is cause for concern, while the increase in areas designated for conservation of biodiversity and for protective purposes is commendable. In short, there was mixed progress over the last 15 years.

Europe. Data availability was high for most of the variables. The status of forest resources was essentially stable, although forests in Europe suffered from occasional storms. The severe storms of 1999 were the main reason for the apparently negative trend in forest health and vitality. The focus of forest management in Europe clearly shifted away from productive functions towards conservation of biological diversity, protection and multiple use, and the area of forest under private ownership increased.

North and Central America. Progress towards sustainable forest management was generally positive in North and Central America as a whole during the period 1990–2005, with none of the annual rates of decreasing trends being more than 0.20 percent – with the exception of the area adversely affected by insects, disease and other disturbances. There was, however, considerable variation among subregions as can be seen in Table 2.

TABLE 2
Trends towards sustainable forest management by subregion

Themes and variables	Africa			Asia		
	Eastern and Southern	Northern	Western and Central	East	South and Southeast	Western and Central
Extent of forest resources						
Area of forest	H	H	H	H	H	H
Area of other wooded land	M	L	H	H	M	H
Growing stock of forests	H	H	H	H	H	H
Carbon stock per hectare in forest biomass	H	H	H	H	H	H
Biological diversity						
Area of primary forest	H	H	L	H	H	H
Area of forest designated primarily for conservation of biological diversity	H	H	L	H	H	H
Total forest area excluding area of productive forest plantations	H	H	L	H	H	H
Forest health and vitality						
Area of forest affected by fire	–	–	–	H	H	H
Area of forest affected by insects, disease and other disturbances	–	–	–	H	L	M
Productive functions of forest resources						
Area of forest designated primarily for production	H	H	L	H	H	H
Area of productive forest plantations	H	H	L	H	H	H
Commercial growing stock	H	L	L	H	M	H
Total wood removals	H	H	H	H	H	H
Total NWFP removals	–	–	–	H	L	M
Protective functions of forest resources						
Area of forest designated primarily for protection	H	H	L	H	H	H
Area of protective forest plantations	H	H	L	H	H	H
Socio-economic functions						
Value of total wood removals	–	L	–	H	H	H
Value of total NWFP removals	–	M	–	–	L	M
Total employment	L	M	L	H	M	H
Area of forest under private ownership	H	H	H	H	H	H
Area of forest designated primarily for social services	H	H	L	H	H	H

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

= Positive change (greater than 0.50%)
= No major change (between -0.50 and 0.50%)
= Negative change (less than -0.50%)
– = Insufficient data to determine trend

Oceania. The status of information for Oceania was generally very weak, and low data availability was a serious issue in the region. For two-thirds of the variables, there was insufficient data to determine regional trends. Thus it is difficult to assess progress towards sustainable forest management.

South America. Overall, progress towards sustainable forest management was fairly mixed. The increasing trend of net forest loss in the area is disturbing, as is the current rate of loss of primary forests. Yet there were also some positive signs in the significant increases in area of forest designated for conservation of biodiversity and for social services. The decrease in removals of fuelwood reflects a reduced demand for this product in the region, but was partly offset by an increase in removals of industrial wood. The area of productive forest plantations increased and may meet more of the demand for wood in the future.

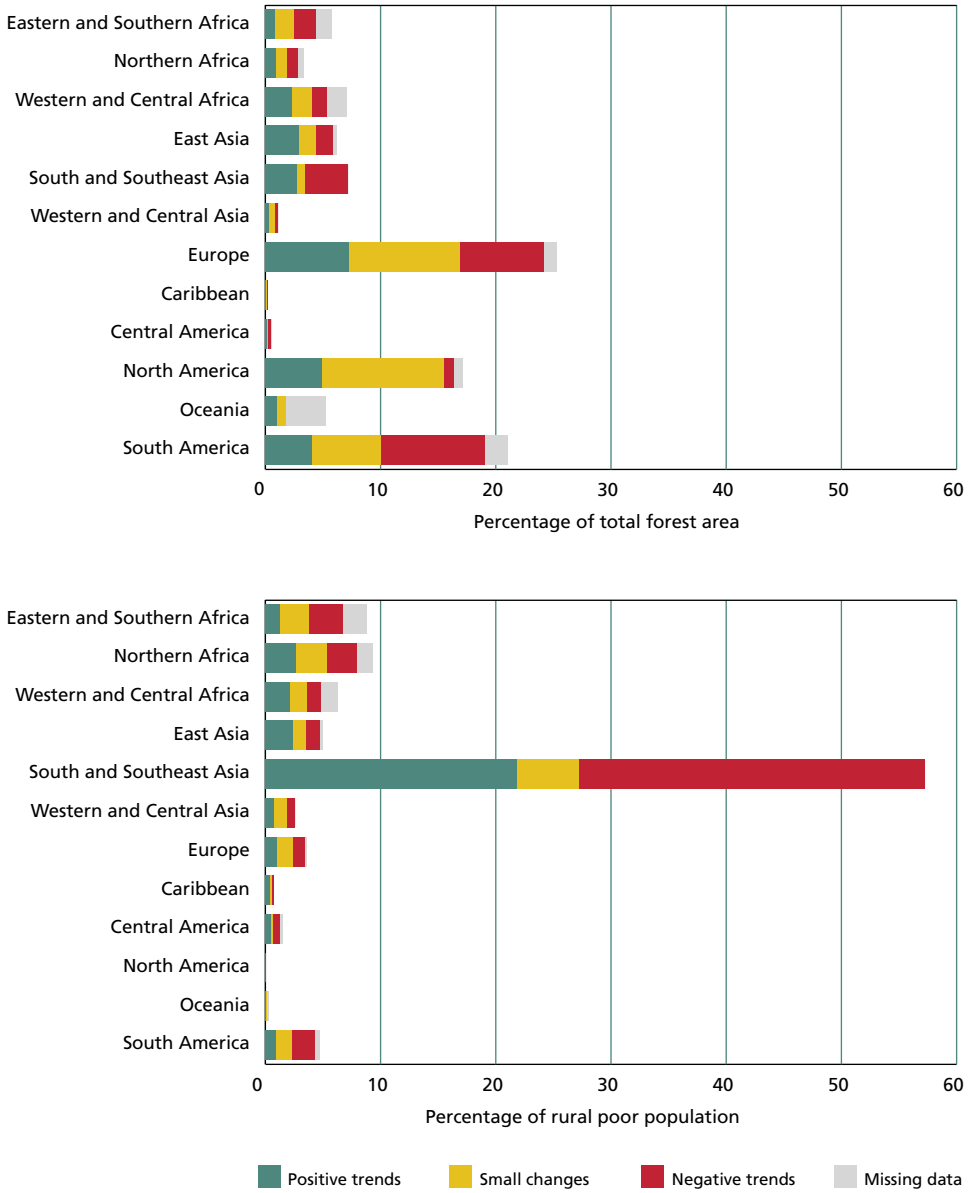
Europe	North and Central America			Oceania	South America	Themes and variables
	Caribbean	Central	North			
						Extent of forest resources
H	H	H	H	H	H	Area of forest
H	H	H	M	–	L	Area of other wooded land
H	H	H	H	–	M	Growing stock of forests
H	L	–	–	–	M	Carbon stock per hectare in forest biomass
						Biological diversity
H	M	H	H	H	H	Area of primary forest
H	M	H	H	–	H	Area of forest designated primarily for conservation of biological diversity
H	M	H	H	H	H	Total forest area excluding area of productive forest plantations
						Forest health and vitality
H	M	–	H	–	H	Area of forest affected by fire
H	–	–	H	–	M	Area of forest affected by insects, disease and other disturbances
						Productive functions of forest resources
H	M	H	H	–	H	Area of forest designated primarily for production
H	M	H	H	H	H	Area of productive forest plantations
H	M	M	H	–	M	Commercial growing stock
H	H	H	H	H	H	Total wood removals
H	L	–	–	–	M	Total NWFP removals
						Protective functions of forest resources
H	M	H	H	–	H	Area of forest designated primarily for protection
H	M	H	H	H	H	Area of protective forest plantations
						Socio-economic functions
–	L	H	M	–	H	Value of total wood removals
H	L	–	M	–	M	Value of total NWFP removals
H	H	M	H	H	–	Total employment
H	M	M	H	–	–	Area of forest under private ownership
H	M	H	H	–	H	Area of forest designated primarily for social services

Forest or poverty perspective?

In considering progress towards sustainable forest management, the very large differences in size and population structure must be taken into consideration. Two parameters – forest area and the number of rural poor people – were selected and applied as arbitrary weights to indicate the relative significance of the observed trends (Figure 14).

When weighting by forest area, Europe, North America and South America dominate the picture. It is also clear that Europe and North America contribute considerably to the positive trends and less to the negative ones, whereas the opposite is true for South America. Overall, there seems to be a balance between positive and negative trends, assuming that the selected variables are valid, that they are all weighted equally and that a weighting by forest area of each subregion is relevant.

FIGURE 14
Distribution of subregional trends[1]



[1] The number of observed trends for each subregion in Table 8.9 has been multiplied by forest area (top), and number of rural poor (bottom). The results have been scaled to show the proportion in percentages of observed changes in each case.

When weighting by rural poor population, the picture becomes dramatically different. Some of the African subregions are more prominent, and the subregion of South and Southeast Asia dominates. Obviously, the developed regions become less significant as there are relatively few rural poor in these areas. Compared with the weighting by forest area, there is a higher proportion of negative trends from this poverty perspective.

Is there progress towards sustainable forest management?

Given the complexity of this question, the answer cannot be a definitive one. There are many good signs and positive trends, but many negative trends remain. While intensive forest plantation and conservation efforts are on the rise, primary forests continue to become degraded or converted to agriculture at alarming rates in some regions. As the analyses above illustrate, the answer also depends on the scale and perspective applied.

CONCLUSIONS

FRA 2005 is the most comprehensive assessment to date, in terms of both the content and the number of contributors. It tells us that forests cover 30 percent of the land area of planet Earth. They range from boreal and temperate forests to arid woodlands and tropical moist forests. And from undisturbed primary forests to forests managed and used for a variety of purposes.

FRA 2005 also tells us that deforestation continues at an alarmingly high rate, but that the net loss of forest area is slowing down thanks to forest planting, landscape restoration and natural expansion of forests on abandoned land.

Forests are increasingly being conserved and managed for multiple uses and values, and they play a crucial role in climate change mitigation and in the conservation of biodiversity and of soil and water resources. If managed sustainably, forests also contribute significantly to local and national economies and to the well-being of current and future generations.

By providing new information on forest area change – one of the 48 indicators of the Millennium Development Goals – FRA 2005 allows assessment of the important role of world forest resources in meeting the targets for reducing poverty and ensuring a sustainable global environment.

By also providing data on carbon, biological diversity, forests' contribution to national economies and many more variables, FRA 2005 aims to support decision-making for policies and programmes in forestry and sustainable development at all levels.

NEXT STEPS

An in-depth evaluation of FRA 2005 will be carried out in early 2006, and readers are encouraged to provide inputs. FAO will also continue to work actively with countries to identify and address information gaps for continuous improvement of knowledge of forests and forestry. Joint planning for the next global assessment (FRA 2010) will begin in 2006, and an expert consultation (Kotka V) is planned for June 2006 to provide inputs to this next assessment.

Chapter 1
Introduction

Global forest resources assessments, coordinated by FAO, have been carried out at five to ten year intervals since FAO was established in 1945.[1] The mandate for these assessments is found in the FAO Constitution, which states that "The Organization shall collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture. In this Constitution, the term 'agriculture' and its derivatives include fisheries, marine products, forestry and primary forestry products." (Article I, Functions of the Organization, paragraph 1) (FAO, 2000).

The Global Forest Resources Assessment 2005 (FRA 2005) was requested by FAO member countries during the sixteenth session of the FAO Committee on Forestry (COFO) in March 2003 (FAO, 2003a). It is the most comprehensive assessment to date, both in terms of contributors and content. More than 800 people have been involved, including 172 national correspondents and their teams, an advisory group, international experts, FAO staff, consultants and volunteers from around the world.

The scope and content of the global assessments have evolved over time to respond to changing information needs. The main concern driving the first FAO-led assessment was well expressed in the first sentence of its report: "The whole world is suffering from shortages of forest products" (FAO, 1948). Studies of timber supply trends dominated FRAs through the 1960s. From the 1970s through FRA 1990, environmental dimensions of forest resources were in focus, in particular the rate of deforestation. FRA 2000 was designed to cover a wider range of forest benefits and functions, but severe information shortages made reporting on key trends difficult. In addition, users and the media still appeared to be primarily interested in forest area and area change (Holmgren and Persson, 2002).

FRA 2005 reflects a more ambitious approach. In line with recommendations made by the FAO expert consultation on Global Forest Resources Assessments – Linking National and International Efforts, held in Kotka, Finland in 2002 (Kotka IV), and COFO in 2003, the reporting framework for FRA 2005 is based on the sustainable forest management concept, encompassing social, economic and environmental dimensions of forest resources. Further, the FRA 2005 process has involved countries to a much higher degree than previous assessments, leading to a higher response rate and quality control of information at the national level.

This broader approach has also led to closer collaboration with other reporting processes, to avoid duplication of effort for variables that are reported to several agencies. For example, the variables related to forest biomass and carbon were harmonized with the specifications of the Intergovernmental Panel on Climate Change (IPCC), variables on endangered species with the *IUCN 2000 red list of threatened species* (World Conservation Union – IUCN, 2000), and quantity of removals with the *FAO Yearbook of Forest Products* (FAO, 2003b). The proportion of land area under forests, reported to FAO as part of FRA 2005, is also used as one of the indicators of progress in reaching the Millennium Development Goals (United Nations, 2005a). Efforts have continued to establish and maintain globally consistent definitions in the FRA process, in order to ensure consistency over time and reduce the overall reporting burden on countries.

[1] The reporting years have been as follows: 1946-1948, 1953, 1958, 1963, mid-1970s (regional assessments), 1980, 1988, 1990, 1995 and 2000.

The present report provides a comprehensive overview of the results of FRA 2005 grouped according to six themes, covering key aspects of sustainable forest management:

- Extent of forest resources
- Biological diversity
- Forest health and vitality
- Productive functions of forest resources
- Protective functions of forest resources
- Socio-economic functions

Each of these chapters begins with a short overview describing the theme and how it relates to sustainable forest management. Next, the relevant variables included in FRA 2005 are listed, together with the availability of information on these. Key findings are presented, followed by separate sections for each of the variables, highlighting current status and trends.

In Chapter 8, an attempt is made to synthesize the results and key trends that illustrate progress towards sustainable forest management at subregional, regional and global levels.

Chapter 9 states the main conclusions of the FRA 2005 process and its results, including some considerations regarding future assessments. This chapter is followed by the bibliography and by annexes providing country statistics and other background material.

More information on the content and structure of the report and on the FRA 2005 process is provided below.

THE REPORTING FRAMEWORK

Sustainable forest management and FRA 2005

The term 'sustainable forest management' can be traced to the non-binding 'Forest Principles' and Chapter 11 of Agenda 21, which were prominent outputs of the United Nations Conference on Environment and Development (UNCED) in June 1992.

The guiding objective of the Forest Principles is to contribute to the management, conservation and sustainable development of all types of forests and to provide for their multiple and complementary functions and uses. Principle 2b specifically states, "Forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations."

The concept of sustainable forest management has continued to evolve since 1992 through international forest policy dialogue within the Intergovernmental Panel on Forests (IPF), the Intergovernmental Forum on Forests (IFF) and the United Nations Forum on Forests (UNFF) – and through a large number of country-led and ecoregional initiatives aimed at translating the concept into practice. These include the development of criteria for and indicators of sustainable forest management supported by international organizations including FAO, the International Tropical Timber Organization (ITTO), the United Nations Environment Programme (UNEP) and other members of the Collaborative Partnership on Forests (CPF).

Sustainable forest management is also the main theme of the FAO Strategic Plan for Forestry (FAO, 1999a), whose mission is "to enhance human well-being through support to member countries in the sustainable management of the world's trees and forests".

Despite, or perhaps because of, the long maturing process of the sustainable forest management concept, it is difficult to define explicitly what sustainable forest management is. However, several recent international meetings have suggested that the seven thematic elements in Box 1.1 are key components.

Following the Kotka IV recommendation to use the sustainable forest management concept as a reporting framework, some basic attributes of FRA 2005 were developed in collaboration with the FRA advisory group and national correspondents:

BOX 1.1

Thematic elements of sustainable forest management

The seven thematic elements of sustainable forest management described below are based on the nine ongoing regional/international processes on criteria and indicators for sustainable forest management[1] and have been acknowledged by FAO member countries and the UNFF.

1. Extent of forest resources

The theme expresses an overall desire to have adequate forest cover and stocking, including trees outside forests, to support the social, economic and environmental dimensions of forestry. For example, the existence and extent of specific forest types are important as a basis for conservation efforts. The theme encompasses ambitions to reduce deforestation and to restore and rehabilitate degraded forest landscapes. It also includes the important function of forests and trees outside forests to store carbon and thereby contribute to moderating the global climate.

2. Biological diversity

The theme concerns the conservation and management of biological diversity at ecosystem (landscape), species and genetic levels. Such conservation, including the protection of areas with fragile ecosystems, ensures that diversity of life is maintained, and provides opportunities to develop new products in the future, including medicines. Genetic improvement is also a means of increasing forest productivity, for example to ensure high wood production levels in intensively managed forests.

3. Forest health and vitality

Forests need to be managed so that the risks and impacts of unwanted disturbances are minimized, including wildfires, airborne pollution, storm felling, invasive species, pests, diseases and insects. Such disturbances may impact social and economic as well as environmental dimensions of forestry.

4. Productive functions of forest resources

Forests and trees outside forests provide a wide range of wood and non-wood forest products. This theme expresses the ambition to maintain an ample and valuable supply of primary forest products, while at the same time ensuring that production and harvesting are sustainable and do not compromise the management options of future generations.

5. Protective functions of forest resources

The theme addresses the role of forests and trees outside forests in moderating soil, hydrological and aquatic systems, maintaining clean water (including healthy fish populations) and reducing the risks and impacts of floods, avalanches, erosion and drought. Protective functions of forest resources also contribute to ecosystem conservation efforts and have strong cross-sectoral aspects, because the benefits to agriculture and rural livelihoods are high.

6. Socio-economic functions

The theme covers the contributions of forest resources to the overall economy, for example through employment, values generated through processing and marketing of forest products, and energy, trade and investment in the forest sector. It also addresses the important forest function of hosting and protecting sites and landscapes of high

cultural, spiritual or recreational value, and thus includes aspects of land tenure, indigenous and community management systems, and traditional knowledge.

7. Legal, policy and institutional framework
The theme includes the legal, policy and institutional arrangements necessary to support the above six themes, including participatory decision-making, governance and law enforcement, and monitoring and assessment of progress. It also involves broader societal aspects, including fair and equitable use of forest resources, scientific research and education, infrastructure arrangements to support the forest sector, transfer of technology, capacity-building, and public information and communication.

[1] African Timber Organization (FAO, 2001a); Dry-Zone Africa Process on Criteria and Indicators for Sustainable Forest Management; International Tropical Timber Organization; Lepaterique Process of Central America on Criteria and Indicators for Sustainable Forest Management; Montreal Process on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests; Near East Process on Criteria and Indicators for Sustainable Forest Management; Pan-European Forest Process on Criteria and Indicators for Sustainable Forest Management; Regional Initiative for the Development and Implementation of National-Level Criteria and Indicators for the Sustainable Management of Dry Forests in Asia; and the Tarapoto Proposal of Criteria and Indicators for Sustainability of the Amazon Forest.

Source: www.fao.org/forestry/site/24447/en.

- FRA 2005 should only address the first six thematic elements, i.e. it should not address the element related to the legal, policy and institutional framework for sustainable forest management.
- FRA 2005 should focus on forest resources, their management and uses, i.e. it should include primary production of forest products such as removals of wood and non-wood products, but it should not include further processing, marketing or benefits beyond the forest gate. One implication is that, conceptually, not all aspects of thematic elements 4–6 are addressed by FRA 2005.
- FRA 2005 should focus on trends for all included variables, acknowledging that it is the change and change rate, as opposed to a static assessment that will form the basis for determining the level of progress towards sustainable forest management.

In the design phase of FRA 2005, tests were made to incorporate country-specific assessments of progress towards sustainable forest management. The results include a case study for India (FAO, 2003c) using the Delphi methods to assign weights to selected national parameters. However, this approach was not applied in FRA 2005.

FRA 2005 reporting tables

Fifteen reporting tables were developed to address the thematic elements of sustainable forest management (Table 1.1). The tables, including variables and definitions, were subject to intensive review by the FRA advisory group and national correspondents before finalization (FAO, 2004a). Detailed specifications for the tables, variables and definitions, as well as the guidelines for reporting, were translated into five languages (FAO, 2004b, 2004c, 2004d, 2005b) and are available online. Countries were asked to provide information for the 15 tables for three points in time: 1990, 2000 and 2005 (with the exception of a few variables for which forecasting to 2005 was not indicated). Linkages among the tables and the six thematic elements addressed in FRA 2005 are illustrated in Table 1.2.

TABLE 1.1
FRA 2005 reporting tables

1 Forest extent	6 Biomass stock	11 Wood removals
2 Ownership	7 Carbon stock	12 Value of wood removals
3 Designated functions	8 Disturbances	13 Non-wood forest product (NWFP) removals
4 Forest characteristics	9 Tree species occurrence	14 Value of NWFP removals
5 Growing stock	10 Composition of growing stock	15 Employment

TABLE 1.2
Indicative linkages between reporting tables and thematic elements of sustainable forest management

Reporting table	Thematic elements					
	Extent of forest resources	Biological diversity	Health and vitality	Productive functions	Protective functions	Socio-economic functions
1. Forest extent	✓	✓		✓		
2. Ownership	✓					✓
3. Designated functions		✓		✓	✓	✓
4. Forest characteristics	✓	✓	✓	✓	✓	✓
5. Growing stock	✓	✓		✓		✓
6. Biomass stock	✓	✓		✓		✓
7. Carbon stock	✓			✓		✓
8. Disturbances	✓		✓	✓	✓	✓
9. Tree species occurrence	✓	✓		✓		✓
10. Composition of growing stock	✓	✓		✓		✓
11. Wood removals	✓			✓		✓
12. Value of wood removals				✓		✓
13. NWFP removals	✓	✓		✓		✓
14. Value of NWFP removals				✓		✓
15. Employment						✓

Countries and areas included in FRA 2005

A total of 229 countries and areas are included in FRA 2005, based on the list used by the United Nations Statistics Division (234 countries and areas) (United Nations, 2005b) with the following changes:

The following seven reporting units are excluded:

- Aaland Islands (included under Finland)
- Guernsey (included under Channel Islands)
- Hong Kong (included under China)
- Jersey (included under Channel Islands)
- Macao (included under China)
- Norfolk Island
- Svalbard and Jan Mayen Islands

The following two reporting units are added:

- British Indian Ocean Territory
- South Georgia and the South Sandwich Islands

For each of the 229, a country report has been prepared and issued as an FRA 2005 working paper. A separate working paper (FRA 2005 Country Report 230 – FAO, 2005c) has been prepared for Antarctica and 28 dependent or disputed territories (including Norfolk, Svalbard and Jan Mayen Islands) that have no, or no significant, areas of forest.

Regions and subregions

The FRA 2005 breakdown into six regions is the same as that used in other FAO publications, including FRA 2000, and follows well-established delineations. However,

owing to the difference in size of individual countries, this breakdown means that, in some regions, one or a few countries dominate the regional results. The Russian Federation is included in Europe and dominates those statistics; the Caribbean and Central America are combined with North America and tend to be overshadowed by Canada and the United States; and Australia dominates the regional results for Oceania.

A breakdown was created to provide more detail for three of the regions: Africa, Asia and North and Central America. Each of these was divided into three subregions, bringing the total number of reporting areas to 12. The subregional divisions are somewhat arbitrary, but are intended to represent areas with similar environmental and socio-economic conditions. Table 1.3 summarizes key statistics for the regions and subregions and Figure 1.1 provides a graphic illustration of the countries included in each.

THE PROCESS

FRA 2005 started with the Kotka IV expert consultation in July 2002 (FAO, 2002a) and has taken three and a half years to implement (Figure 1.2). The delivery of outputs includes the release of global statistics, key findings and the 229 country reports (November 2005); launch of the present report in February 2006; and subsequent releases of the thematic studies during 2006. It will be officially closed at the Kotka V expert consultation, scheduled for June 2006, with an evaluation of the project.

FRA 2005 involved more than 800 people (Annex 1) and was coordinated by the Forest Resources Development Service at FAO headquarters in Rome. Eight staff members and consultants were engaged full time throughout the project, including focal points for each region who facilitated communications between the national correspondents and FAO.

Besides the core staff, a large number of FAO staff, consultants and volunteers were engaged in various phases of FRA 2005 as specialists within specific subjects, as assistants in the preparation of reports for countries and areas without a national correspondent, as regional staff in decentralized offices and as developers of thematic studies.

The United Nations Economic Commission for Europe (UNECE) in Geneva was a key institutional partner, handling communications and support to European countries.

TABLE 1.3
Key statistics for regions and subregions used in FRA 2005[1]

Region/subregion	No. of countries and areas	Total area *(million hectares)*	Population *(million)*	Rural population *(% of population)*	Rural poor population *(% of rural population)*	Population increase *(%/year)*
Eastern and Southern Africa	20	834	235	63	43	1.8
Northern Africa	16	1 550	315	62	34	2.3
Western and Central Africa	22	647	318	57	27	2.5
Total Africa	**58**	**3 031**	**868**	**61**	**34**	**2.2**
East Asia	5	1 176	1 528	56	4	0.7
South and Southeast Asia	18	898	1 963	68	32	1.6
Western and Central Asia	25	1 103	347	41	13	4.3
Total Asia	**48**	**3 177**	**3 838**	**61**	**21**	**1.5**
Total Europe	**47**	**2 298**	**723**	**27**	**14**	**-0.1**
Caribbean	25	23	39	35	38	0.9
Central America	7	52	39	47	60	2.3
North America	5	2 197	429	21	0	1.1
Total North and Central America	**37**	**2 273**	**508**	**24**	**14**	**1.2**
Total Oceania	**24**	**856**	**33**	**27**	**23**	**1.2**
Total South America	15	1 784	365	18	52	1.4
World	**229**	**13 419**	**6 335**	**51**	**23**	**1.4**

[1] Population figures from World Bank, 2005

FIGURE 1.1
Regional and subregional breakdown used in FRA 2005

FIGURE 1.2
FRA 2005 Timeline

An FRA advisory group was established and has had four meetings since early 2003 (see Annex 5 for details). Members of the group represent partner institutions, including ITTO, the Ministerial Conference for the Protection of Forests in Europe (MCPFE), UNEP, the UNEP-World Conservation Monitoring Centre (WCMC) and the World Resources Institute (WRI), as well as a range of countries from all regions. The advisory group has been instrumental in the development of FRA 2005, as well as fulfilling a valuable oversight and review function.

In line with recommendations from Kotka IV and COFO 2003, FAO requested countries to officially nominate a national correspondent to the FRA process. The response to this request has been very strong from practically all countries. At present, 172 national correspondents are confirmed. These correspondents, and their respective professional networks in the countries, represent a tremendous strength of the FRA 2005 process, and were responsible for coordinating inputs and preparing country reports according to a standard format in English, French or Spanish. A training session attended by more than 100 national correspondents was held in November 2003 in Rome, and detailed guidelines, specifications and reporting formats were provided.

The reporting format required countries to provide the full reference for original data sources and an indication of the reliability of the data for each of these, as well as definitions of terminology. Separate sections in these reports deal with analysis of data (including any assumptions made and the methodologies used for estimates and projections of data to the three reference years, 1990, 2000 and 2005); calibration of data to the official land area as held by FAO; and reclassification of data to the classes used in FRA 2005. Comments to the tables yield additional information, particularly where countries have experienced difficulty in matching national classes to those used in FRA 2005.

Regional focal points at FAO headquarters and its regional and subregional offices were in regular contact with national correspondents throughout the process. An electronic discussion forum and a list of frequently asked questions were provided on the FRA 2005 Web site to further facilitate the reporting process.

Once received, the draft country reports underwent detailed reviews to ensure completeness and correct application of definitions and methodologies – including the reclassification of national data into the FRA 2005 classification system. Internal consistency was checked and a comparison made with information provided for FRA 2000, the FAO/EUROSTAT/ITTO/UNECE Joint Forest Sector Questionnaire and other published sources of information.

A total of ten regional and subregional workshops were held to review the draft reports (see Annex 5 for details). These workshops provided an opportunity to share experiences and to address specific questions and issues related to data availability and interpretation. The final reports are thus the result of an iterative process and a collaborative effort.

The data were then entered into FAO's Forestry Information System (FORIS) and global tables were generated. Subject specialists at FAO analysed these tables and prepared subregional, regional and global overviews for each topic of the main report. Before publishing the key findings and the global tables, all country reports were sent to the head of forestry in the respective country for final validation.

Main outputs from FRA 2005

In addition to the present report, other major outputs of FRA 2005 include:

- ***Country reports.*** A total of 229 detailed country reports have been prepared, listing the data sources and original data and describing the methodologies used for estimation, forecasting and reclassification, as well as any assumptions made. These reports are available on the FRA 2005 Web site (www.fao.org/forestry/site/fra2005/) in English, French or Spanish. Hard copies are available upon request.
- ***Global tables***. A set of 20 global tables have been compiled based on the country information provided. These can be found in Annex 3 and are also available on the above Web site.
- ***Key findings***. Fifteen key findings of FRA 2005 were released in November 2005. A flyer describing these is available in English, French, Spanish, Arabic, Chinese and Russian on the FRA 2005 Web site or in hard copy upon request.

- ***Thematic studies***. Seven thematic studies provide complementary information on specific topics: planted forests, mangroves, bamboo, wildland fires, forest pests, forests and water, and forest ownership and resource tenure. Each of these studies is being published separately.
- ***Working papers.*** A number of FRA working papers have been prepared as part of the FRA 2005 process. They are listed in Annex 4.

Chapter 2

Extent of forest resources

OVERVIEW

Extent of forest resources is the first of the thematic elements characterizing sustainable forest management. Generally speaking, it refers to the overall goal of maintaining adequate forest cover and stocking – of various forest types and characteristics including on 'other wooded land' and as 'trees outside forests' – to support the social, economic and environmental objectives related to forestry within a country or region. The ultimate aim of monitoring the extent and characteristics of forest resources is to reduce unplanned deforestation, restore and rehabilitate degraded forest landscapes, manage forests sustainably and evaluate the important function of carbon sequestration by forests, other wooded land and trees outside forests – thereby contributing to moderating the global climate (FAO, 2005d).

Information on the extent of forest resources has formed the backbone of all global forest resources assessments and continued to be a major topic in FRA 2005. Forest area is an easily understood baseline variable, which provides a first indication of the relative importance of forests in a country or region. Estimates of change in forest area over time provide an indication of the demand for land for forestry and other land uses, as well as of the impact of significant environmental disasters and disturbances on forest ecosystems. As mentioned previously, the proportion of land area under forests is also used in the Millennium Development Goals indicator process (United Nations, 2005a).

However, as was observed in FRA 2000 (FAO, 2001b), the significance of forest area as a single indicator of forest development has often been overemphasized, particularly in the public debate, where other aspects of forest resources feature less prominently. The most commonly quoted result from global forest resources assessments continues to be the global net loss of forest area. However, it is important to note that many other parameters and scales must be considered in determining the relevant trends in the extent of forest resources. Growing stock and carbon storage may be considered equally important parameters, as they indicate whether forests are degraded and to what extent they mitigate climate change. Further, the net loss of forest area is not in itself sufficient to describe land-use dynamics that include both loss of forests due to deforestation and natural disasters and gains in forest area from planting or natural expansion.

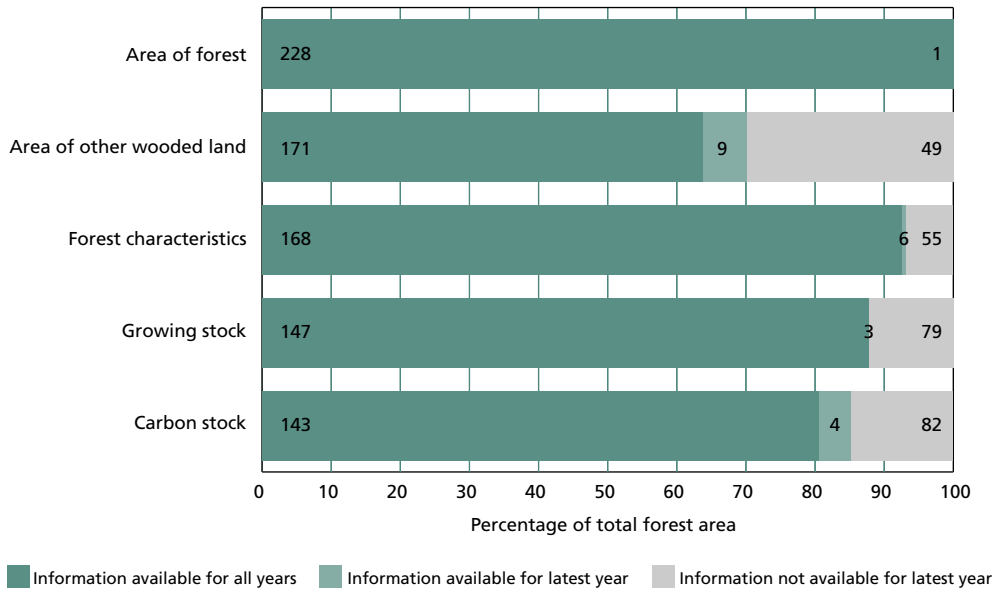
For FRA 2005, information was sought on the current status and changes over time of the following four variables:

- area of 'forest' and 'other wooded land'. Countries were also encouraged to provide information on 'other land with tree cover';[1]
- characteristics of forests and other wooded land according to five classes: primary, modified natural, semi-natural, protective forest plantations and productive forest plantations;
- standing volume of wood, i.e. the total growing stock in forests and other wooded land;
- carbon stock contained in woody biomass, dead wood, litter and forest soils.

Figure 2.1 illustrates the availability of information for these variables at the global level.

[1] See Annex 2 for exact definitions.

FIGURE 2.1
Information availability – extent of forest resources



Note: Figures present number of countries in each category.

In regional and ecoregional criteria and indicator processes, as well as in national reports, more-detailed classifications of the forest area are often used, e.g. according to forest or vegetation type, age structure or diameter distribution classes. Because of the varying conditions and classification systems among countries and regions, it was not feasible to report on such classifications at the global level. However, country reports for FRA 2005 contain considerably more detail than is shown in the global tables. Moreover, thematic studies have been prepared on planted forests, mangroves and bamboo that provide in-depth knowledge on these forest types and groups of species.

In FRA 2000, an independent remote sensing survey was carried out to supplement country reporting for the pan-tropical region. The results constituted an important ingredient in the analysis of global and regional trends, leading, for example, to a calibration of reported changes in forest area for Africa. The survey also provided considerable insight into change processes in land use, including the documentation of different patterns of land-use change in tropical regions. The results have been widely acknowledged and used (e.g. Mayaux *et al.*, 2005). While no similar project was carried out for FRA 2005 owing to lack of resources, preparations have been made for a more ambitious approach (FAO, 2003d) that takes a broader range of information requirements into account. This approach is being considered for the next global forest resources assessment (FRA 2010).

KEY FINDINGS

Based on the information provided, total forest area in 2005 is estimated to be just under 4 billion hectares (ha) or 30 percent of total land area. This corresponds to an average of 0.62 ha of forest per capita.

However, area of forest is unevenly distributed. For example, 64 countries with a combined population of 2.0 billion have less than 0.1 ha of forest per capita. Often described as low forest cover countries (LFCCs), they include a number of fairly large countries in arid zones, as well as many small island developing states (SIDS)

and dependent territories. The ten most forest-rich countries account for two-thirds of total forest area, while seven countries or territories have no forest at all, and an additional 57 have forest on less than 10 percent of their total land area.

Deforestation, mainly due to conversion of forests to agricultural land, continues at an alarmingly high rate – some 13 million hectares per year. At the same time, forest planting, landscape restoration and natural expansion of forests have significantly reduced the net loss of forest area.

Net global change in forest area in the period 2000–2005 is estimated at -7.3 million hectares per year (an area about the size of Panama or Sierra Leone), down from -8.9 million hectares per year in the period 1990–2000.

South America suffered the largest net loss of forests from 2000 to 2005 – about 4.3 million hectares per year – followed by Africa, which lost 4.0 million hectares annually.

North and Central America and Oceania each had a net loss of about 350 000 ha, while Asia, which had a net loss of some 800 000 ha per year in the 1990s, reported a net gain of 1 million hectares per year from 2000 to 2005, primarily as a result of large-scale afforestation reported by China. Forest areas in Europe continued to expand, although at a slower rate than in the 1990s.

Total area of other wooded land is estimated to be at least 1 376 million hectares – about one-third the size of total forest area. Total area of other land with tree cover was reported to be 76 million hectares, but is undoubtedly much higher as information availability was limited.

An estimated 36 percent of total forest area is classified as primary forests, i.e. forests of native species, in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed. About 6 million hectares of these forests were lost or modified each year since 1990, and there is no indication that the rate of change is slowing down. This rapid decrease stems not only from deforestation, but also from modification of forests due to selective logging and other human interventions through which primary forests move into the category of modified natural forests.

The global area of modified natural forests (forests of naturally regenerated native species in which there are clearly visible indications of human activity) is about 2 billion hectares (53 percent of all forests). An estimated 7 percent of the world's forests are semi-natural forests – i.e. forests comprising native species, established through planting, seeding or assisted natural regeneration.

Forests and trees are being planted for many purposes and at increasing rates, yet they still account for a fairly small proportion of total forest area. Forest plantations – a subset of planted forests consisting primarily of introduced species – make up an estimated 4 percent of total forest area. Productive forest plantations, primarily established for wood and fibre production, account for 78 percent of these, and protective forest plantations, primarily established for conservation of soil and water, account for 22 percent. The area of forest plantations increased by about 14 million hectares during 2000–2005, or 2.8 million hectares per year, 87 percent of which are productive forest plantations.

Total area of mangroves is estimated at 15.2 million hectares as of 2005, down from 18.8 million hectares in 1980. Close to half the total mangrove area (47 percent) is found in five countries: Indonesia, Australia, Brazil, Nigeria and Mexico.

The area of bamboo is difficult to assess, as these species often occur as patches within forests or as clusters outside them. Nevertheless, preliminary findings based on reports from 30 of the main bamboo-rich countries indicate that the total area is about 40 million hectares – or 1 percent of the global forest area – and is increasing.

In 2005 the total global growing stock of forests was estimated at 434 billion m^3, which corresponds to an average of 110 m^3 per hectare. The countries with the most growing stock per hectare were found in central Europe and some tropical areas.

Total growing stock shows a slight overall downward tendency – mainly owing to a decrease in forest area. However, some regions also show significant trends in growing stock per hectare, for example Europe shows an increase and Southeast Asia a decrease.

It is estimated that the world's forests store 283 gigatonnes (Gt) of carbon in their biomass alone and 638 Gt of carbon in the ecosystem as a whole (to a soil depth of 30 cm). Thus forests contain more carbon than the entire atmosphere. Roughly half of total carbon is found in forest biomass and dead wood combined and half in soils and litter combined.

Carbon in forest biomass decreased in Africa, Asia and South America in the period 1990–2005, but increased in all other regions. For the world as a whole, carbon stocks in forest biomass decreased by 1.1 Gt of carbon annually, owing to continued deforestation and forest degradation, partly offset by forest expansion (including planting) and an increase in growing stock per hectare in some regions.

In conclusion, considerable progress has been made towards reversing the overall trend of forest area loss, and several variables related to extent of forest resources show no significant negative trends or even a positive trend over time in some countries and regions. Yet deforestation, including conversion of forests to agricultural land, continues at an alarmingly high rate. Considerable efforts are needed before the overall trend in extent is positive or stable in all regions.

FOREST AREA AND FOREST AREA CHANGE

Forest area provides the first indication of the relative importance of forests in a country or region, while estimates of forest area change over time provide an indication of the demand for land for forestry and other land uses, and may also illustrate the impact of significant environmental disasters and disturbances on forest ecosystems. Forest area is relatively easy to measure, and this variable has therefore been selected as one of the 48 indicators for monitoring progress towards the Millennium Development Goals agreed by the United Nations (particularly Goal 7 – Ensuring environmental sustainability).

Data on the status of and trends in area of forest are crucial to decisions related to forest and land-use policies and resource allocations, but they need to be combined with information on the health and vitality of forests and their socio-economic and environmental functions and values. Other sections of this report deal with these aspects.

Information availability

Information on the extent of forests was provided by 228 of the 229 countries and areas reporting for FRA 2005 – the exception being the Marshall Islands, for which no quantitative information was available. Antarctica and some of the smaller dependent territories, which do not have, or have no significant, forest area were not included in the list of reporting units for FRA 2005.

Four countries or areas (Guam, Guyana, Lebanon and the Occupied Palestinian Territory) did not provide an estimate of forest area for 1990. All other countries and areas provided estimates for all three reporting years (1990, 2000 and 2005). For the purpose of analysis, the 1990 forest area for each of these four countries and areas was estimated by FAO based on a linear extrapolation of the figures provided for 2000 and 2005.

Since extent of forest resources is a key variable for decisions regarding forest policy and investments in the forestry sector, almost all countries and areas provided information on this variable. However, some countries had comprehensive information from only one point in time (see Table 2 in Annex 3), while others had estimates that were incompatible, making trend analyses difficult.

Information on the extent of other wooded land as of 2005 was available from 180 countries and areas, which together account for 64.9 percent of total forest area.

Only 61 countries and areas reported on current extent of other land with tree cover, which is a new variable in global forest resources assessments. It aims to capture those areas in which forest cover criteria are met, but the predominant land use is agricultural (e.g. orchards and oil-palm plantations) or urban (e.g. urban parks).

Status

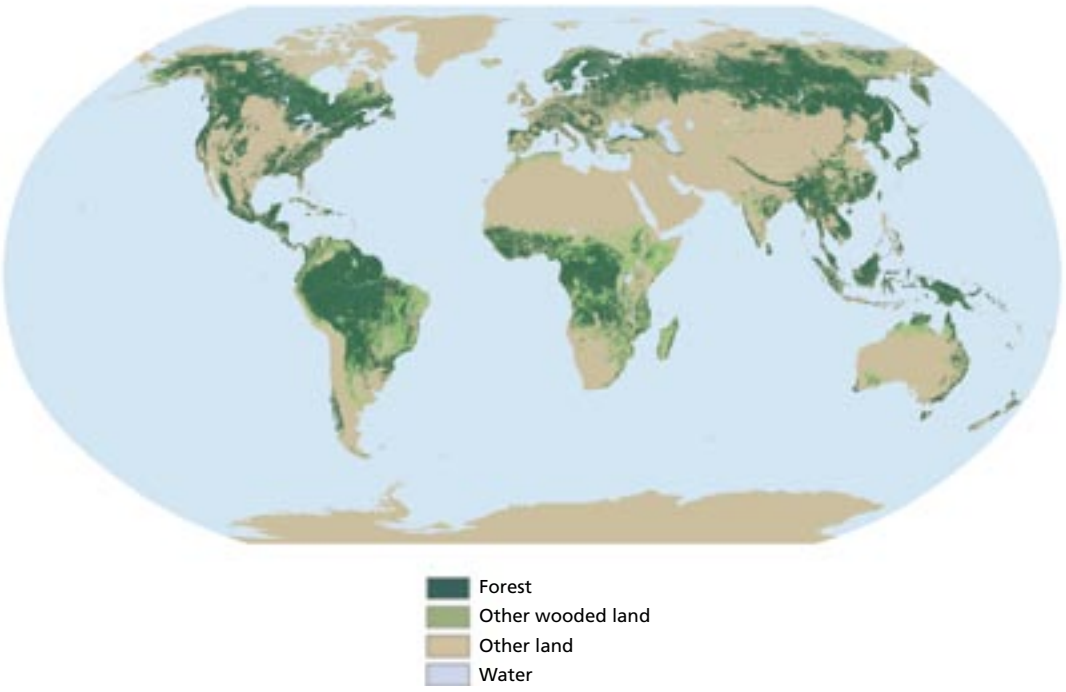
Total forest area as of 2005 is estimated at 3 952 million hectares or 30 percent of total land area. This corresponds to an average of 0.62 ha per capita. As can be seen from Figure 2.2, the area of forest is unevenly distributed. For example, 64 countries with a combined population of 2.0 billion have less than 0.1 ha of forest per capita.

Based on available information, total area of other wooded land is estimated to be at least 1 376 million hectares – about one-third of total forest area. This category suffered from reclassification problems, particularly in dry zones such as those in Australia, Kenya and the Sudan, in which the distinction between forest and other wooded land is not very clear. Total area of other land with tree cover is at least 76 million hectares. These two estimates, particularly the latter, were limited by lack of information, and the true extent of other land with tree cover is undoubtedly much higher.

Distribution of forests. A subregional summary of the distribution of forests is shown in Table 2.1. Europe accounts for one-quarter of total forest area, followed by South America and North and Central America with 21 and 18 percent respectively. Information on the area of forest and other wooded land by country can be found in Table 3 in Annex 3.

Forest-rich and forest-poor countries. The five most forest-rich countries (the Russian Federation, Brazil, Canada, the United States and China) account for more than half of total forest area (2 097 million hectares or 53 percent). The Russian Federation alone

FIGURE 2.2
The world's forests



accounts for 20 percent of the world total. Seven countries have more than 100 million hectares of forest each. The ten most forest-rich countries account for 66 percent of total forest area (Figure 2.3). The remaining 34 percent is spread among 212 countries and areas. Seven countries and areas (the Falkland Islands, Gibraltar, the Holy See, Monaco, Nauru, South Georgia and South Sandwich Islands and Tokelau) reported having no areas that qualify as forests using the FRA 2005 definition.

High and low forest cover countries. Forty-five countries and areas have more than half their total land area covered by forests (Figure 2.4), and 11 of these have more than 75 percent of their total land area covered. Most of these are small island states or territories, but the list also includes three low-lying coastal states in South America and one country in the Congo Basin (Table 2.2).

Sixty-four countries and areas have less than 10 percent of their total land area covered by forests. These include many SIDS and dependent territories, as well as 17 larger

TABLE 2.1
Distribution of forests by subregion 2005

Region/subregion	Forest area *(1 000 ha)*	% of global forest area
Eastern and Southern Africa	226 534	5.7
Northern Africa	131 048	3.3
Western and Central Africa	277 829	7.0
Total Africa	**635 412**	**16.1**
East Asia	244 862	6.2
South and Southeast Asia	283 127	7.2
Western and Central Asia	43 588	1.1
Total Asia	**571 577**	**14.5**
Total Europe	**1 001 394**	**25.3**
Caribbean	5 974	0.2
Central America	22 411	0.6
North America	677 464	17.1
Total North and Central America	**705 849**	**17.9**
Total Oceania	**206 254**	**5.2**
Total South America	**831 540**	**21.0**
World	**3 952 025**	**100.0**

FIGURE 2.3
Ten countries with largest forest area 2005
(million ha)

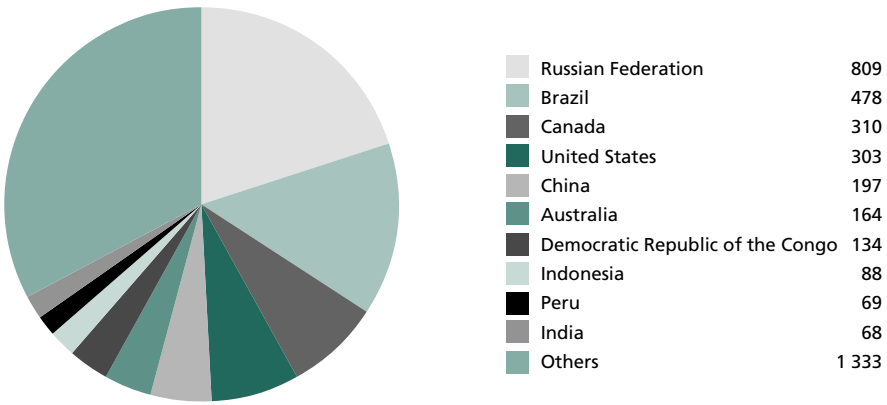


FIGURE 2.4
Forest area in percent of land area by country 2005

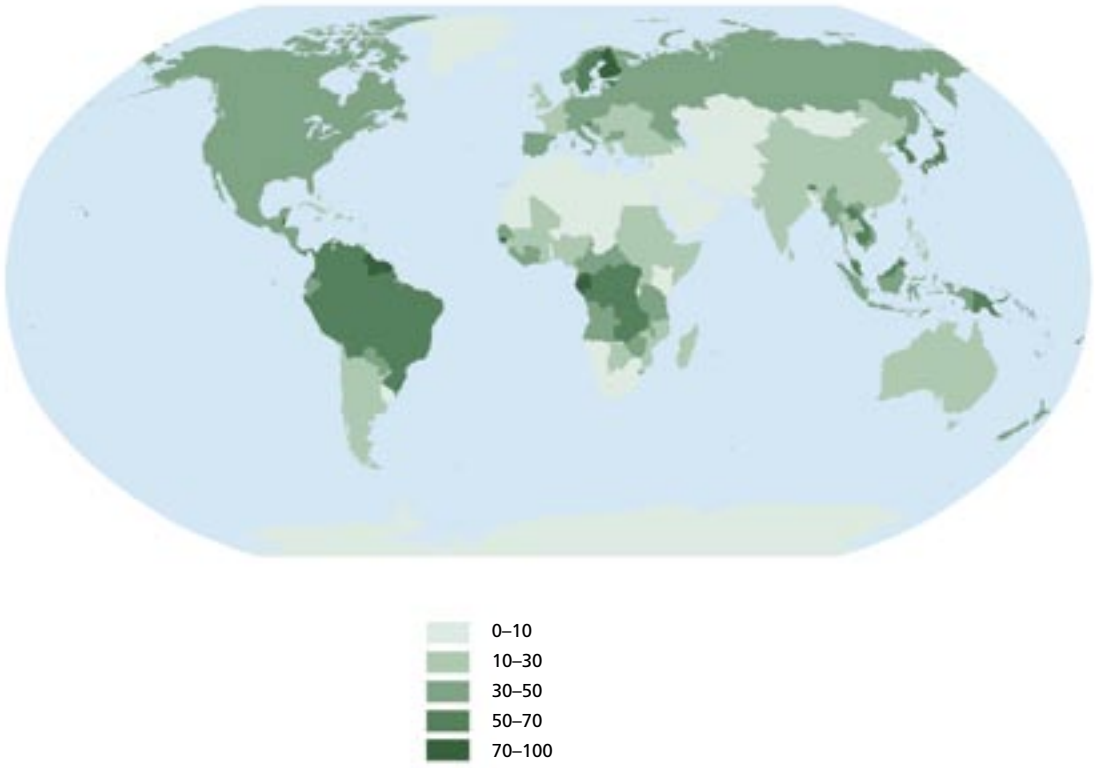


TABLE 2.2
High forest cover countries 2005

Country	Forest area *(1 000 ha)*	% of total forest area
Suriname	14 776	94.7
French Guiana	8 063	91.8
Micronesia (Federated States of)	63	90.6
American Samoa	18	89.4
Seychelles	40	88.9
Palau	40	87.6
Gabon	21 775	84.5
Pitcairn	4	83.3
Turks and Caicos Islands	34	80.0
Solomon Islands	2 172	77.6
Guyana	15 104	76.7

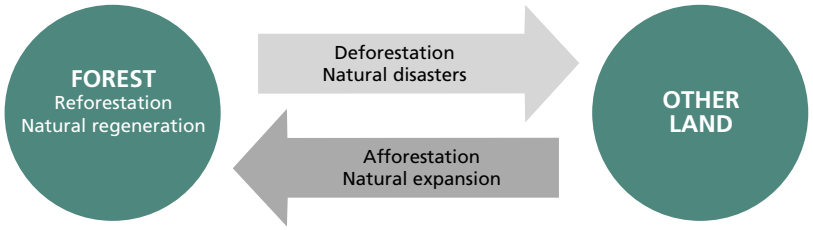
countries with relatively substantial forest areas (more than 1 million hectares each). Three of these (Chad, the Islamic Republic of Iran and Mongolia) have more than 10 million hectares of forest, but still qualify as LFCCs.

At the regional level, South America is the region with the highest percentage of forest cover, followed by Europe and North and Central America. Asia is the region with the lowest percentage of forest cover (Table 2.3).

TABLE 2.3
Forest cover by subregion 2005

Region/subregion	Forest area *(1 000 ha)*	% of land area
Eastern and Southern Africa	226 534	27.8
Northern Africa	131 048	8.6
Western and Central Africa	277 829	44.1
Total Africa	**635 412**	**21.4**
East Asia	244 862	21.3
South and Southeast Asia	283 127	33.4
Western and Central Asia	43 588	4.0
Total Asia	**571 577**	**18.5**
Total Europe	**1 001 394**	**44.3**
Caribbean	5 974	26.1
Central America	22 411	43.9
North America	677 464	32.7
Total North and Central America	**705 849**	**32.9**
Total Oceania	**206 254**	**24.3**
Total South America	**831 540**	**47.7**
World	**3 952 025**	**30.3**

FIGURE 2.5
Forest change dynamics



Trends

Figure 2.5 is a simplified model illustrating forest change dynamics. It has only two classes: forests and all other land. A *reduction* in forest area can happen through either of two processes. Deforestation, which is by far the most important, implies that forests are cleared by people and the land converted to another use, such as agriculture or infrastructure. Natural disasters may also destroy forests, and when the area is incapable of regenerating naturally and no efforts are made to replant it, it, too, reverts to other land.

An *increase* in forest area can also happen in two ways: Either through afforestation, i.e. planting of trees on land that was not previously forested, or through natural expansion of forests, e.g. on abandoned agricultural land – which is quite common in some European countries.

Where part of a forest is cut down but replanted (reforestation), or where the forest grows back on its own within a relatively short period (natural regeneration), there is no change in forest area.

For FRA 2005, countries were asked to provide information on their forest area for three points in time. This allows calculation of the net change in forest area over time. This net change is the sum of all negative changes due to deforestation and natural disasters and all positive changes due to afforestation and natural expansion of forests.

The total net change in forest area in the period 1990–2000 is estimated at -8.9 million hectares per year – equivalent to a loss of 0.22 percent of the remaining forest area each year during this period.

The total net change in forest area in the period 2000–2005 is estimated at -7.3 million hectares per year – an area the size of Panama or Sierra Leone – or equivalent to a loss of 200 km² of forest per day. Compared to the 1990s, the current annual net loss is 18 percent lower and equals a loss of 0.18 percent of the remaining forest area each year during this period.

Countries were not requested to provide information on each of the four components of net change, as most countries do not have such information. This, however, makes estimation of the deforestation rate difficult and no attempt has been made to do so at the country level. Rather, an estimate of the global deforestation rate has been made as follows:

The total net loss for countries with a negative change in forest area was 13.1 million hectares per year for 1990–2000 and 12.9 million hectares per year for 2000–2005. This would indicate that annual deforestation rates were at least at this level. Since the net change rate takes into account afforestation efforts and natural expansion of forests, the rate of deforestation might be higher still. On the other hand, Brazil, which accounts for 21 percent of the total net loss in the period 1990–2000 and 24 percent in 2000–2005, calculated its forest area in 2005 and 1990 based on information from 2000 and the sum of annual figures of the area of forests cleared. It did not take into account to what extent the land use of these areas had changed and to what extent cleared lands had been abandoned and had reverted to forest through natural regeneration. Such naturally regenerated secondary forests are thought to be quite extensive, but insufficient information is available to estimate the extent. Thus the area of deforestation and the net loss of forests in Brazil are likely overestimated.

Taking these considerations into account, the global deforestation rate was estimated at 13 million hectares per year during the period 1990–2005, with few signs of a significant decrease over time.

In summary, deforestation continues at an alarming rate – but the rate of net loss is decreasing due to afforestation and natural expansion of forests in some countries and regions.

Trends in area of other wooded land were analysed, based on the 171 countries and areas providing information for all three reporting years. The analysis indicates that other wooded land is more or less constant in North and Central America and Oceania. In Europe and South America, it decreased in the period 1990–2000, but remained almost constant in the period 2000–2005. It decreased in both periods in Africa and Asia. At the global level, area of other wooded land decreased by about 3.3 million hectares per year over the past 15 years. This finding should be treated with caution, however, since many countries do not have compatible information over time for other wooded land, and thus one estimate was frequently used as the best available figure for all three reporting years. Data for other land with tree cover were too limited to allow trend analysis.

Regional and subregional comparisons. Table 2.4 and Figure 2.6 show the changes in area of forest by region and subregion. South America suffered the largest net loss of forests from 2000 to 2005 – about 4.3 million hectares per year – followed by Africa, which lost 4.0 million hectares annually. While there are signs that the net loss in Africa is decreasing, it seems to be increasing in South America – primarily due to a reported increase in the net loss of forests in Brazil. However, as indicated above, the net loss reported by Brazil for both periods may be overestimated. Efforts are currently underway to design and implement a national forest assessment on a pilot basis in Brazil, which should yield better information for the next global forest resources assessment.

North and Central America and Oceania each had a net loss of about 350 000 ha, with a decreasing trend in Oceania, and a slightly increasing trend in North and Central America – the latter primarily owing to a decrease in the plantation establishment rate in the United States (down from an average of 596 900 ha per year in 1990–2000 to an average of 157 400 ha per year in the period 2000–2005) and the continued, albeit decreasing, net loss of forests in Mexico.

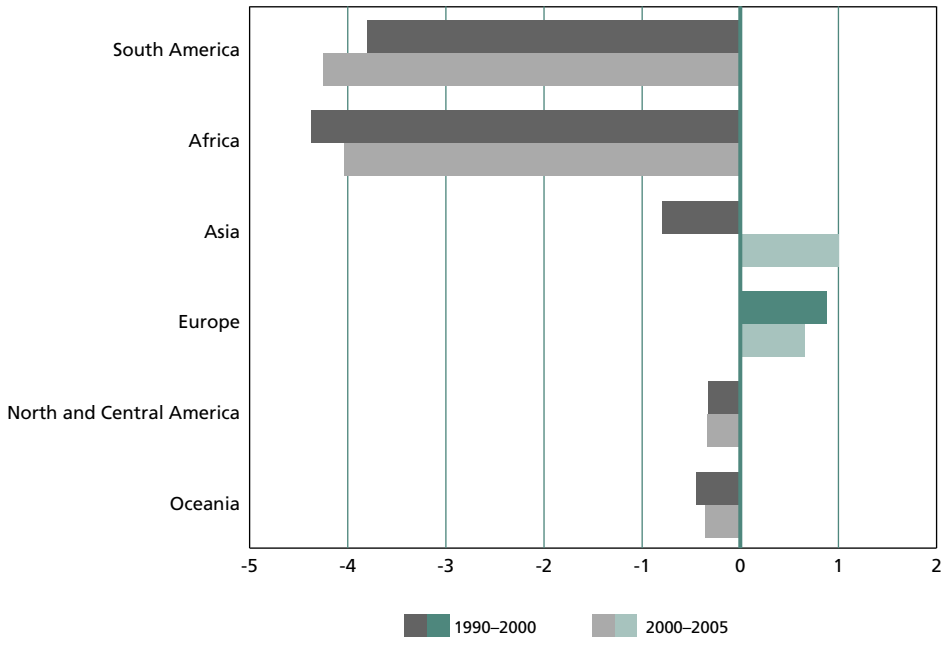
TABLE 2.4
Annual changes in forest area by subregion 1990–2005

Region/subregion	1990–2000		2000–2005	
	1 000 ha	%	1 000 ha	%
Eastern and Southern Africa	-1 731	-0.71	-1 702	-0.74
Northern Africa	-1 013	-0.72	-982	-0.73
Western and Central Africa	-1 631	-0.56	-1 356	-0.48
Total Africa	**-4 375**	**-0.64**	**-4 040**	**-0.62**
East Asia	1 751	0.81	3 840	1.65
South and Southeast Asia	-2 578	-0.83	-2 851	-0.98
Western and Central Asia	34	0.08	14	0.03
Total Asia	**-792**	**-0.14**	**1 003**	**0.18**
Total Europe	**877**	**0.09**	**661**	**0.07**
Caribbean	36	0.65	54	0.92
Central America	-380	-1.47	-285	-1.23
North America	17	n.s.	-101	-0.01
Total North and Central America	**-328**	**-0.05**	**-333**	**-0.05**
Total Oceania	**-448**	**-0.21**	**-356**	**-0.17**
Total South America	**-3 802**	**-0.44**	**-4 251**	**-0.50**
World	**-8 868**	**-0.22**	**-7 317**	**-0.18**

Note: percentages represent the proportion of remaining forest area lost or gained each year during the respective period.

n.s. = not significant

FIGURE 2.6
Annual net change in forest area by region 1990–2005
(million ha per year)



Asia, which had a net loss of some 800 000 ha per year in the 1990s, reported a net gain of 1 million hectares per year from 2000 to 2005, primarily as a result of the large-scale afforestation reported by China. Forest areas in Europe continued to expand, although at a slower rate than in the 1990s. For information on changes in forest area by country, see Table 4 in Annex 3.

Countries with large positive or negative changes. In the Caribbean, Europe, North America, Oceania and Western and Central Asia, a majority of countries have no major changes over the last five years, while in Africa a majority of countries have a negative change rate (Figure 2.7).

A large number of countries in Oceania and the Caribbean have reported no major change, primarily because of lack of data and particularly for more than one point in time.

The ten countries with the largest *net loss* per year in the period 2000–2005 had a combined net loss of forest area of 8.2 million hectares per year (Table 2.5).

The ten countries with the largest *net gain* per year in the period 2000–2005 had a combined net gain of forest area of 5.1 million hectares per year due to afforestation efforts and natural expansion of forests (Table 2.6). The large increase in forest area for China is due to recent, large-scale afforestation programmes.

FIGURE 2.7
Countries with large net changes in forest area 2000–2005

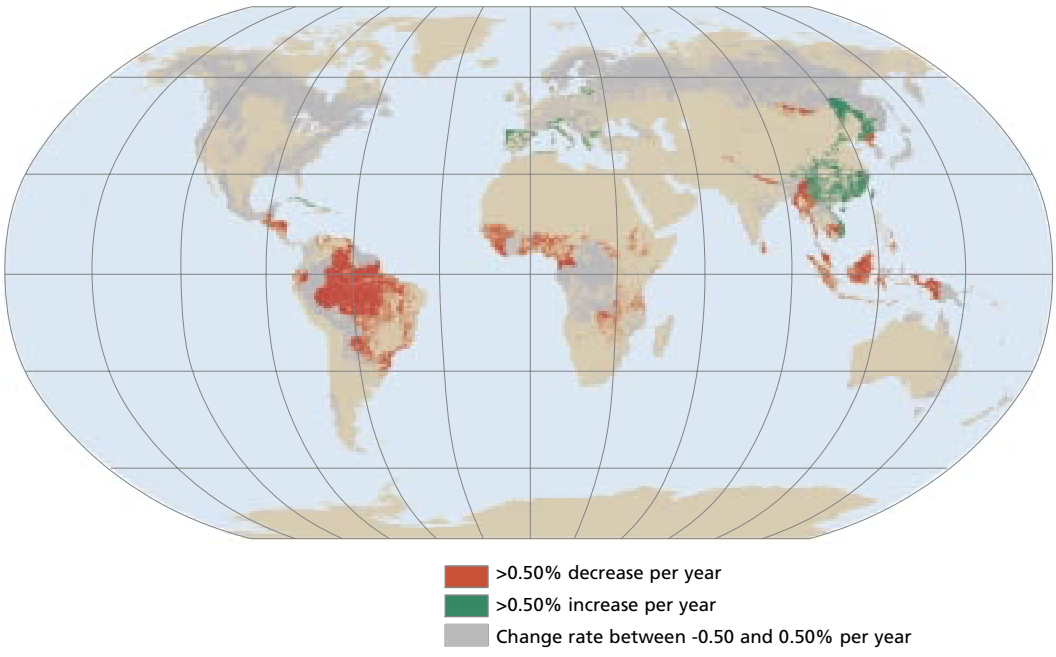


TABLE 2.5
Ten countries with largest annual net loss in forest area 2000–2005

Country	Annual change *(1 000 ha/yr)*
Brazil	-3 103
Indonesia	-1 871
Sudan	-589
Myanmar	-466
Zambia	-445
United Republic of Tanzania	-412
Nigeria	-410
Democratic Republic of the Congo	-319
Zimbabwe	-313
Venezuela (Bolivarian Republic of)	-288
Total	**-8 216**

TABLE 2.6
Ten countries with largest annual net gain in forest area 2000–2005

Country	Annual change *(1 000 ha/yr)*
China	4 058
Spain	296
Viet Nam	241
United States	159
Italy	106
Chile	57
Cuba	56
Bulgaria	50
France	41
Portugal	40
Total	**5 104**

Thirty-seven countries and areas have an estimated net negative change rate of 1 percent or more per year. The ten countries with the largest annual net negative change rates for 2000–2005 are: Comoros (-7.4 percent); Burundi (-5.2 percent); Togo (-4.5 percent); Mauritania (-3.4 percent); Nigeria (-3.3 percent); Afghanistan (-3.1 percent); Honduras (-3.1 percent); Benin (-2.5 percent); Uganda (-2.2 percent) and the Philippines (-2.1 percent).

Eighteen countries have an estimated annual positive change rate of 1 percent or more due to natural expansion of forests and afforestation. The ten countries with the largest estimated annual positive change rates for 2000–2005 are: Rwanda (6.9 percent); Iceland (3.9 percent); Bahrain (3.8 percent); Lesotho (2.7 percent); Kuwait (2.7 percent); Egypt (2.6 percent); China (2.2 percent); Cuba (2.2 percent); Viet Nam (2.0 percent) and Tunisia (1.9 percent).

Most but not all of the countries with large change rates measured in percentages are LFCCs or countries with a limited forest area, where a relatively small change in absolute values results in a large change in relative or percentage terms.

Comparison with previous estimates

Countries were asked to provide estimates for three points in time for FRA 2005: 1990, 2000 and 2005. The figures provided for 1990 and 2000 are likely to differ slightly from those reported for the previous assessment (FRA 2000) for the following reasons:

First, the estimates presented in both assessments are derived primarily through linear interpolation and extrapolation of the results from two or more recent assessments. National forest resources assessments are fairly expensive, thus they are often carried out at infrequent intervals and a new data set can significantly change previous forecasts based, for example, on estimates from the 1970s or 1980s.

Second, many more countries were actively involved in the FRA 2005 process than in previous assessments, and the national correspondents helped provide access to better and more recent information, while their detailed knowledge of forest types helped improve the reclassification of data into FRA 2005 categories.

Table 2.7 shows a comparison of the results provided in FRA 2000 and those reported in FRA 2005 for reporting years 1990 and 2000.

Globally, total forest area estimated in FRA 2005 for 1990 and 2000 was about 3 percent higher than that in FRA 2000. This was primarily owing to reclassification of unproductive forests in Canada and the United States (previously classified as other wooded land), but also to new and better information from other countries.

Most countries provided estimates of forest area that differed from those provided for FRA 2000. Many differences were minor and due to calibration of areas to match the official land areas as found in the FAO database FAOSTAT (FAO, 2005a). Others were due to reclassifications or to new and better information and, in some cases, resulted in significantly different figures.

A total of 79 countries provided estimates for 1990 for FRA 2005 that differed by more than 10 percent from those presented for FRA 2000. Similarly, a total of 85 countries provided new figures for 2000 that differed by more than 10 percent from those presented for FRA 2000. A separate working paper has been prepared explaining these differences (FAO, 2006a).

Annual net loss of forests in the 1990s appears to have been overestimated in previous studies. FRA 2000 estimated the annual net change in global forest area to be -9.4 million hectares per year for the period 1990–2000. FRA 2005 estimates the rate for the same period to be -8.9 million hectares per year, i.e. half a million hectares less per year.

The main differences are found in Africa, where the net loss is 1 million hectares lower than previously estimated, and in Asia, where FRA 2005 estimates a higher

TABLE 2.7
Comparison of forest area estimates in FRA 2005 and FRA 2000

Region	FRA 2005 estimates			FRA 2000 estimates		
	Forest area *(1 000 ha)*		Annual change *(1 000 ha/yr)*	Forest area *(1 000 ha)*		Annual change *(1 000 ha/yr)*
	1990	2000	1990–2000	1990	2000	1990–2000
Africa	699 361	655 613	-4 375	702 502	649 866	-5 262
Asia	574 487	566 562	-792	551 448	547 793	-364
Europe	989 320	998 091	877	1 030 475	1 039 251	881
North and Central America	710 790	707 514	-328	555 002	549 304	-570
Oceania	212 514	208 034	-448	201 271	197 623	-365
South America	890 818	852 796	-3 802	922 731	885 618	-3 711
World	**4 077 291**	**3 988 610**	**-8 868**	**3 963 429**	**3 869 455**	**-9 391**

loss for the 1990s than previously reported, primarily due to a revised change rate for Indonesia, based on more recent information.

For Africa, the results for FRA 2005 are closer to the results of the independent remote sensing analysis done for FRA 2000, which indicated that the net annual loss was -2.2 million hectares, while the reports indicated a net loss of -5.5 million hectares. However, the net loss of 4.3 million hectares reported for FRA 2005, which is based on national reports, may still be overestimated.

FOREST CHARACTERISTICS

The request for information on forest characteristics aimed to provide more detailed information on the kinds of forest that exist, in terms of their 'naturalness' or the intensity of silviculture and management practices. A continuum exists from primary forests with no – or no visible – indications of past or present human activity to intensively managed forest plantations of introduced species, primarily managed for a single product, often on a relatively short rotation. Between these two extremes lies a range of scenarios, and there are no clear cut-off points between possible classes along the continuum.

Countries were asked to characterize their forests and other wooded land according to five classes: primary, modified natural, semi-natural, protective forest plantation and productive forest plantation.

The first three classes comprise native forest tree species only, with the possible exception of small areas of natural regeneration of introduced or naturalized species in the semi-natural class. While the origin of primary and modified natural forests is natural regeneration, semi-natural forests are established through assisted natural regeneration, planting or seeding, while all forest plantations are established through planting or seeding.

Planted forests thus comprise all forest plantations and parts of semi-natural forests. All planted forests of introduced species were classified as forest plantations in FRA 2005. Planted forests of native species were classified as forest plantations if characterized by few species, straight, regularly spaced rows and/or even-aged stands. If they resembled natural forests of the same species mix, such as many planted forests in Europe, they were classified as semi-natural forests.

A thematic study on planted forests, including the planted-forest component of both semi-natural forests and forest plantations, is being completed for release during 2006 to complement the data available in FRA 2005 (Box 2.1).

The use of the five different classes helps clarify the extent to which forests are human-made or -modified, while at the same time providing an indication of the

BOX 2.1

FRA 2005 thematic study on planted forests

This study complements FRA 2005 with more detailed data, information and analysis on planted forests around the globe. Its aims are to: provide inputs into a global outlook on the future supply of forest products and services from planted forests; better understand the role of planted forests in the mosaic of land uses in the broader landscape; and offer factual inputs into the ongoing process of deriving a planted forest code.

A survey is being undertaken of countries reporting high proportions of semi-natural forests and large areas of forest plantations. As a first step, the survey requested countries to differentiate the planted forest component of semi-natural forests and forest plantations, collectively known as the planted forest subset.

Management and ownership of planted forests have changed over the period 1990–2005. Consequently, countries were asked to report their management designation for primarily productive or primarily protective purposes, as well as ownership, for the reporting periods 1990, 2000 and 2005. Planted forests managed primarily for productive purposes supply wood, fibre, fuelwood and NWFPs for industrial purposes, but can also provide social, cultural and environmental services. Planted forests managed primarily for protective purposes protect soil and water, rehabilitate degraded lands and conserve biological diversity and carbon sinks, but can also include minor harvesting of forest products. Management parameters reported include the top ten species, growth rates, rotation lengths and age and class distributions for both productive and protective designations, as well as harvest yields for planted forests managed for productive purposes. Ownership is reported as state, private-sector corporate, smallholder or 'other'.

Countries were also asked to report on the main forest products, including sawlogs, pulpwood and fibre, industrial bioenergy, NWFPs and 'unspecified'. In addition, data were solicited on the services offered by planted forests, including the environment, recreation, non-industrial fuelwood and 'unspecified'.

Data collection was carried out by FRA 2005 national correspondents, with the participation of in-country specialists in planted forests. At the time of writing, analysis was being completed for release of the study during 2006. A Web-based knowledge reference centre will be established, offering data, information and reference materials on planted forests and related topics (reproductive materials, forest health, invasive species, etc.) for wide access by stakeholders. The materials will also be provided in hard copy and compact disc for those without access to the Internet.

When available, the information will be posted on the FAO planted forest Web portal: www.fao.org/forestry/site/planted-forest/.

intensity of management and the potential for wood production, e.g. for use in global fibre supply models.

The typical modified forest is a tropical forest in which selective logging has taken place, but no silvicultural measures have influenced the natural regeneration of species. The typical semi-natural forest might be a temperate forest in Europe or a teak forest in Asia, in which the harvesting is much more intense, removing a larger volume and number of trees per hectare, and with specific interventions aimed at securing a desirable future species mix through assisted natural regeneration, seeding or planting of native species.

Forest plantations may be established for different purposes and have been divided into two classes, with protective forest plantations typically being unavailable for wood

supply (or at least having wood production as a secondary objective only) and often consisting of a mix of species managed on long rotations or under continuous cover.

This section provides an overview of status and trends as related to forest characteristics. More detailed information on primary forests can be found in the chapter on biological diversity, while analyses of productive and protective forest plantations can be found in the respective chapters on these themes.

Information availability

Although a large number of countries reported on the characteristics of their forests, information on all five classes was not always readily available, because countries either did not collect information or used a different national classification system. Proxy values have often been used, which makes a detailed analysis of status and trends difficult.

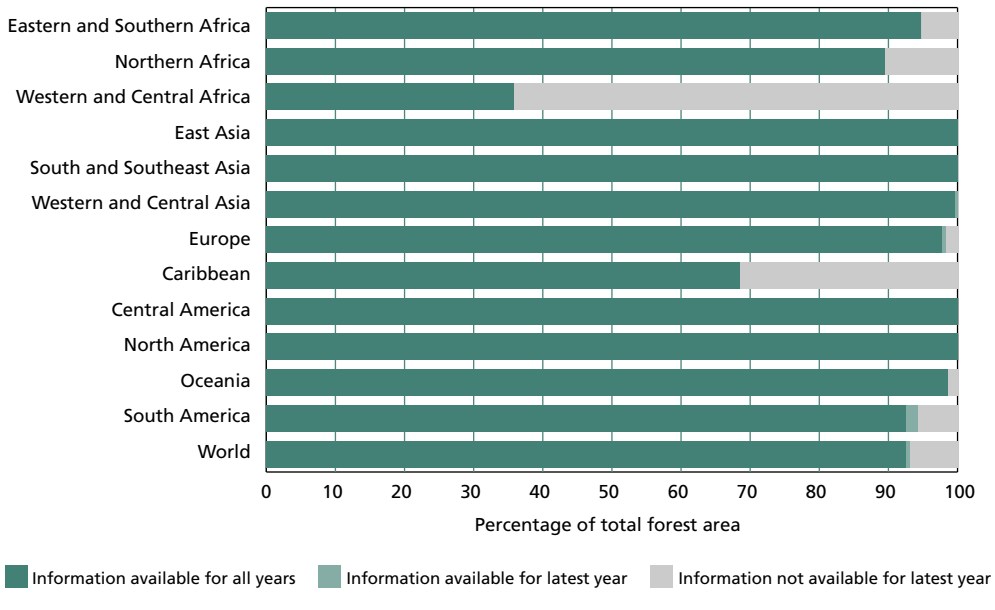
Information was unavailable for many of the countries in the Congo Basin, the second largest expanse of tropical forest, and this should be kept in mind when analysing the findings.

Few countries had information on the area of primary forests. Some used the current area of forests in national parks and other protected areas as a proxy value or provided an expert estimate of the percentage of natural forests that could be considered primary according to the definition used for FRA 2005. There were also some inconsistencies in reporting planted forests of native species: some countries reported these as semi-natural forests, while others preferred to include them as forest plantations. Thus it may not be possible to directly compare figures for different countries, owing to differences in interpretation of the classification systems.

Of 229 countries and areas reporting, 174 reported on the characteristics of their forests. Their combined forest area was estimated at 3 678 million hectares – equivalent to 93 percent of the total forest area of the world (Figure 2.8).

Of the 180 countries providing information on the area of other wooded land, 114 provided information on characteristics.

FIGURE 2.8
Information availability – forest characteristics



Status

More than one-third (36 percent) of total forest area is classified as primary forest, i.e. forest of native species, in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed (Figure 2.9).

Great variation exists in terms of the distribution of primary forests, with limited areas reported from the Caribbean, Europe (excluding the Russian Federation) and the arid zones of Eastern and Southern Africa, Northern Africa and Western and Central Asia. The largest expanse of primary forest is found in South America (the Amazon). Countries in North and Central America and the Russian Federation have also classified a relatively high proportion of their forests as primary.

Slightly more than half of all forests (53 percent) are considered modified natural forests (forests of naturally regenerated native species in which there are clearly visible indications of human activity) and 7 percent are classified as semi-natural forests (forests comprising native species, established through planting, seeding or assisted natural regeneration).

Forest plantations constitute an estimated 4 percent of forest area (forests of introduced species, and in some cases native species, established through planting or seeding), classified either as productive (3 percent of total forest area) or protective (0.8 percent of total forest area).

The vast majority of other wooded land (69 percent) was classified as modified natural, 28 percent as primary and the remaining 3 percent as semi-natural.

Trends

A trend analysis was generated based on the 167 countries providing estimates for all three reporting years,[2] including those reporting no primary forest.

As can be seen in Figure 2.10, the areas of primary forest and modified natural forest are decreasing, while the areas of semi-natural forest and forest plantation are increasing.

About 6 million hectares of primary forest have been lost or modified each year since 1990,[3] and there is no indication that the rate of change is slowing down. This rapid decrease stems not only from deforestation, but also from modification of forests due to selective logging and other human interventions – whereby primary forests move into the class of modified natural forests. The rate of loss of primary forests is stable or slightly decreasing in most subregions, but is increasing in South America and, to a lesser extent, in North America.

Brazil and Indonesia alone account for an annual loss of primary forest of 4.9 million hectares. The data collected do not permit an analysis of how much of this net loss is due to deforestation and how much is owing to areas of forest moving into the modified natural forest class.

A number of countries registered positive change rates in the area of primary forests, including several European countries and Japan (see Table 9 in Annex 3). In most of these cases, countries have been setting aside natural forest areas in which no intervention is to take place. With time, these areas evolve into forests in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed, which is the definition of primary forests used in FRA 2005. Japan and some of the

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[2] This list of countries excludes the Russian Federation (see comment related to primary forests in footnote 3). Australia did not provide information for all categories for 1990; its primary forest has been assumed to be constant and the remaining forest area not classified as forest plantation has been assumed to be modified natural forest based on information from 2000 and 2005.

[3] This estimated net loss excluded the Russian Federation, in which a large difference in the change rate (from -1.6 million hectares per year in the 1990s to +0.5 million hectares per year in the last five years) is likely due to a change in the methodology used, rather than being a reflection of actual change.

FIGURE 2.9
Forest characteristics 2005
(%)

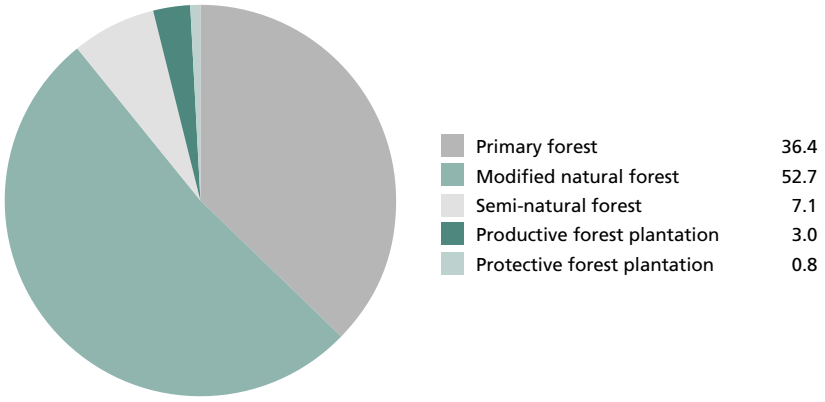
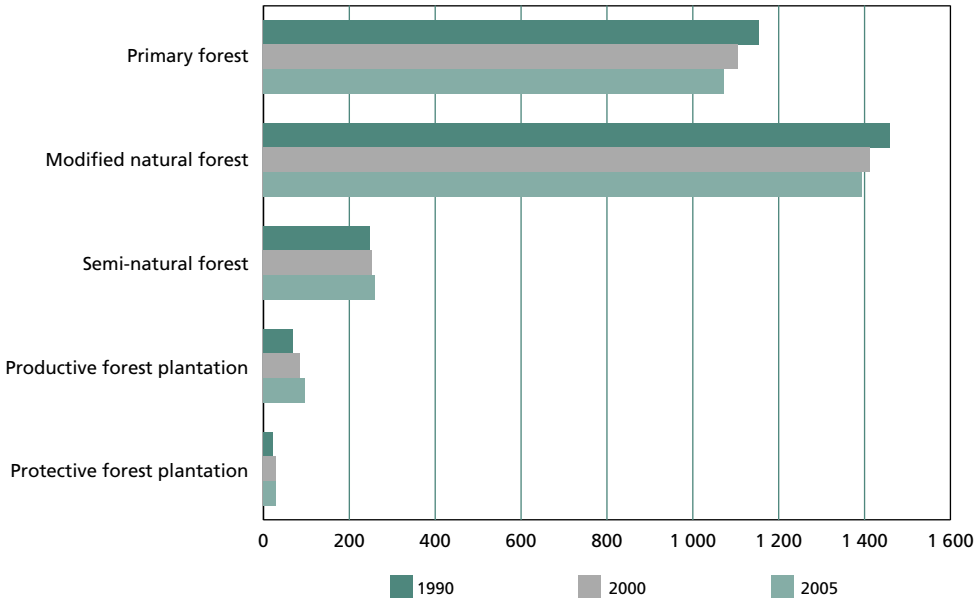


FIGURE 2.10
Global trends in forest characteristics 1990–2005
(million ha)



European countries, for example, classified all natural forests over a certain age or size as primary forests if no interventions had been conducted in the last 25 years.

There has been an increase in the area of forest plantations of about 14 million hectares in the last five years, or about 2.8 million hectares per year, 87 percent of which are in the productive class.

Information availability on the characteristics of other wooded land was insufficient for analysing trends over time.

Forest types and species groups. In addition to the thematic study on planted forests mentioned above, two studies on specific forest types and species groups were undertaken to complement the FRA 2005 main report – one on mangroves (Box 2.2) and another on bamboo (Box 2.3).

The total area of mangroves was estimated at 15.2 million hectares, down from 18.8 million hectares in 1980. An estimated 47 percent of this area was found in five countries: Indonesia, Australia, Brazil, Nigeria and Mexico.

As mentioned earlier, the area of bamboo is difficult to assess, as these species often occur as patches within or outside forests. Nevertheless, preliminary findings based on reports from 30 of the main bamboo-rich countries indicate that total area of bamboo amounts to some 40 million hectares – or 1 percent of the global forest area – and it is increasing.

BOX 2.2

FRA 2005 thematic study on mangroves

Mangroves are salt-tolerant forest ecosystems commonly found along sheltered coastlines, in deltas and along river banks in the tropics and subtropics. These trees and shrubs have developed morphological adaptations to tidal environments, such as aerial roots, salt excretion glands and, in some species, vivipary of seeds.

A large proportion of coastal populations in tropical regions depend on mangroves for their subsistence, either directly through the extraction of wood and non-wood forest products, such as fuelwood, charcoal, timber, food and medicines, or indirectly through the many aquatic and terrestrial species for which these ecosystems provide nutrients and a habitat. Mangroves serve as spawning grounds and nurseries for a variety of fish and shellfish, playing a significant role in the marine food system. When mangrove forests are destroyed, declines in local fish catches often result. These ecosystems also play an important role in preventing and reducing coastal erosion, providing nearby communities with protection against the effects of wind, waves and water current. This was demonstrated during the 2004 tsunami in Asia – in locations in which extensive areas of mangroves existed, coastal villages suffered less damage. Moreover, these unique coastal forests provide other important services: conservation of biological diversity and – by trapping sediment from upland erosion – protection of coral reefs, sea-grass beds and shipping lanes against siltation.

Despite their many important uses and benefits, high population pressure in coastal areas has frequently led to the conversion of mangrove areas to other uses, including fish and shrimp farming, agriculture, salt or rice production and urban development. Mangroves have also been fragmented and degraded due to overexploitation and pollution. Numerous case studies describe mangrove losses over time, but comprehensive information at the global level is scarce. Despite past attempts to estimate total mangrove area, recent reliable information on status and trends at the global level is limited. The past attempts include: FAO and UNEP, 1981a, b and c; Saenger, Hegerl and Davie, 1983; Groombridge, 1992; Clough, 1993; Diop, 1993; Fisher and Spalding, 1993; Lacerda, 1993; Spalding, Blasco and Field, 1997; and Aizpuru, Achard and Blasco, 2000.

The FRA 2005 thematic study on mangroves was coordinated by FAO and cofunded by ITTO. It provides an overview of the current extent of mangroves, their species composition, uses and threats, and changes in the extent of mangroves over time for the 124 countries or areas in which they exist. The study aims to facilitate access to comprehensive, comparable information that may serve as a tool for policy- and decision-makers and mangrove managers worldwide. The initiative builds on FRA 1980 and on information provided for FRA 2000 and 2005, for which countries were asked to provide information on current forest area according to forest types, using their own classification systems. Since mangroves form a distinct and relatively easily defined forest type, most countries with mangroves provided specific information on their extent. An extensive literature search and inputs from national mangrove experts yielded additional information. Where recent national information was lacking, it was updated through interpretation of remote sensing data (an

in-kind contribution from the UNEP World Conservation Monitoring Centre – WCMC). Local authorities and national experts played a key role in the process of gathering and reviewing the extensive country-level information collected. Regression analyses yielded estimates for 1980, 1990, 2000 and 2005 for each country.

About 15.2 million hectares of mangroves currently exist worldwide, down from 18.8 million hectares in 1980, with the largest extent found in Asia, followed by Africa and South America. The area of mangroves present in each country varies from a few hectares to more than 3 million, with close to half the global area found in just five countries: Indonesia, Australia, Brazil, Nigeria and Mexico. Over the last 25 years, 3.6 million hectares of mangroves (or about 20 percent of the total extent found in 1980) have disappeared worldwide. Although alarming, the rate of net loss of mangroves is showing signs of slowing down. From about 185 000 ha lost annually in the 1980s (-1.03 percent per annum), it dropped to some 105 000 ha/year (-0.67 percent) during the 2000–2005 period. This reflects an increased awareness of the value of mangrove ecosystems, which has led, in turn, to the preparation of new legislation, better protection and management and, in some countries, to an expansion of mangrove areas through active planting or natural regeneration.

The detailed findings of the thematic study will consitute an important contribution to the revised *World atlas of mangroves* (www.fao.org/forestry/site/mangrove-atlas). The study report was being completed for release during 2006. Further information on the study and the profiles for the 124 countries or areas in which mangroves occur can be found at www.fao.org/forestry/site/mangrove. The country profiles will also be compiled into five regional reports.

BOX 2.3

FRA 2005 thematic study on bamboo

Bamboo is an integral part of tropical and subtropical forests, and bamboo resources have increasing importance in poverty alleviation and sustainable development of the rural poor. These species continue to play a crucial role in Asia, while their use is rapidly growing in Africa and Latin America. Bamboo is moving out of the craft-industry phase and now provides raw material for preindustrial processing and for industry products (bamboo shoots, construction poles, panelling and flooring products, pulp, etc.), thus gaining significance as both an internationally traded commodity and a tool for livelihood and industrial development.

A first attempt at assessing the extent of bamboo resources at the global level was made by FAO and UNEP as part of FRA 1980, for which 13 countries provided estimates. The FRA 2005 thematic study on bamboo is a joint effort of FAO and the International Network for Bamboo and Rattan (INBAR). The inclusion of bamboo among the seven thematic studies under FRA 2005 seeks to raise awareness of the value, dynamics and importance of the bamboo sector – attracting investment and formulating and redesigning forest policies.

Following the general methodology of the FRA 2005 country reports, the specifically designed bamboo reports included information on the extent and characteristics of bamboo resources, ownership, growing stock, and amount and value of removals. The information provided by 22 country reports was analysed, reviewed and, where needed, complemented by additional information from a literature search and expert consultations. Two workshops were organized to discuss the design of the study and then the preliminary results. Additional information was obtained from the *Production to consumption studies* already carried out by INBAR in various countries. With the integration of existing information

through a systematic data-collection procedure, the thematic study constitutes a focused investigation into the extent of bamboo resources on a global scale.

The quality and quantity of the information varied significantly among regions, with a richer contribution from Asian countries as compared with Africa and Latin America. This was hardly a surprise: it is in the Asian region that bamboo has had the longest tradition of use and where it has a fundamental role today for a significant portion of the population. However, Africa and Latin America are quickly developing greater interest in bamboo resources and their potential, and several country representatives of these regions highlighted the need for more systematic investigation and assessment.

Due to the scattered nature of the data provided and the ongoing analysis, only preliminary results can be offered here. Sixteen countries in Asia reported a total of roughly 25 million hectares of bamboo forest. Major contributors were India (9 million hectares) and China (5 million hectares), followed by Indonesia, Myanmar and Thailand. In this region, bamboo forests constitute approximately 4 percent of the total forest cover, with peaks of over 10 percent for India, Laos and Sri Lanka. Although the information gathered from Africa is still partial, six countries reported a total of approximately 3 million hectares of bamboo forest, with Ethiopia, Kenya and Nigeria showing the largest areas. In Latin America, at least ten countries have significant bamboo resources, although precise assessments have not yet been done. A total of 11 million hectares is considered a realistic estimate for the region, with Brazil, Chile, Colombia, Ecuador and Mexico among the richest in these resources. Information on other characteristics of bamboo forests and the amount and value of removals will be presented in the thematic study, to be released during 2006.

Bamboo is often intermixed with other species or is cultivated outside forests, along village and farm boundaries, which presents a challenge to the study. For this reason, the 'bamboo forest' can have different definitions. In addition, most harvesting and trade occur locally among villages, with no official records. These combined factors explain why current bamboo resource statistics are inconsistent, fragmented and in need of upgrading. Nevertheless, steps to improve the availability of quantitative data have been made by several countries, in recognition of the importance of bamboo to poverty alleviation, forest conservation and economic and environmental development. The main value of this study is thus the development of a systematic methodology for the recording of bamboo forest characteristics and sector data.

GROWING STOCK

Growing stock has formed part of global forest resources assessments since the first report. In addition to providing information on existing wood resources, growing stock estimates constitute the basis for estimation of biomass and carbon stocks for most countries.

Country information on total growing stock and forest area was used to estimate growing stock per hectare as an indicator of how well or poorly stocked the forests are. FRA 2005 has also collected country information on commercial growing stock. Chapter 5 (Productive functions of forest resources) presents results for this indicator, as well as a more detailed discussion of total growing stock.

Information availability

Of the 229 countries and territories covered by FRA 2005, 150 countries, representing 88 percent of the world's forest area, reported on growing stock for 2005. Oceania was the only region for which information was available for only a small portion of forest area (15 percent), given that Australia did not provide information on this variable. With a few exceptions, reporting countries gave information for all three reporting years (see Figure 5.6 in Chapter 5).

Although many countries provided information on growing stock, the quality of the information is variable. A few countries with repeated national forest assessments have very reliable information, but many countries do not have good inventory data to support growing stock estimates and changes in growing stock over time.

Status

In order to obtain consistent global, regional and subregional estimates of total growing stock, growing stock per hectare was estimated for each region/subregion for those countries providing information. These estimates were then multiplied by the total forest area of each region and subregion. Table 5.7 in Chapter 5 shows the status of growing stock in 2005 and its distribution by region and subregion.

Total growing stock is estimated at 434 billion m^3, of which some 30 percent is found in South America.

The five countries with the greatest total growing stock account for almost 261 billion m^3, which corresponds to 60 percent of the global total. Of these, Brazil has the largest growing stock, with 81 billion m^3 or 19 percent of the total.

The global average for growing stock per hectare is 110 m^3/ha. The countries with the highest growing stock per hectare are found in central Europe and in some tropical countries.

Trends

Based on data from the 147 countries that reported growing stock figures for all three reporting years, total growing stock shows a slight decreasing tendency at the global level (see Table 5.9 in Chapter 5). There are some regional tendencies: Africa, Asia and South America show a slight decrease, while Europe and North and Central America show a slight increase.

As regards growing stock per hectare, changes at the global level are not significant. At regional and subregional levels, however, there are more significant changes. For example, Europe, excluding the Russian Federation, shows a net increase of 0.3 percent (or 1.2 m^3 per hectare) annually for the last 15-year period, while South and Southeast Asia show a net decrease of 1.0 percent (or 1.0 m^3 per hectare) annually, mainly due to a decrease in growing stock per hectare in Indonesia.

Changes in total growing stock reflect the combined effects of changes in forest area and in growing stock per hectare. However, for many countries, changes in growing stock reflect only the changes in forest area, because their estimates of growing stock are based on a single figure per hectare determined at one point in time (see Chapter 5). Thus the actual trends may be more pronounced than those in this analysis.

BIOMASS AND CARBON

At a casual glance, the amounts of biomass and carbon seem simply to reflect the extent of forests and their growing stock. A more meaningful understanding emerges in the context of the global carbon cycle, climate change and related international agreements such as the United Nations Framework Convention on Climate Change (UNFCCC). Since half the dry weight of biomass is carbon (IPCC, 2003), the following analysis addresses biomass implicitly. For data related to biomass stock in forest and other wooded land, refer to Table 13 in Annex 3.

Forests, like other ecosystems, are affected by climate change, be it a sea-level rise that threatens coastal forests or changes in temperature and rainfall patterns. In some places, impacts may be negative, while in others they may be positive. However, forests also influence climate and the climate change process. They absorb carbon in wood, leaves and soil and release it into the atmosphere when burned, for example during forest fires or the clearing of forest land.

The Kyoto Protocol entered into force in the same year that this assessment was carried out. The protocol and the UNFCCC oblige all member countries to regularly

assess and report national greenhouse gas emissions, including emissions and removals of carbon reflected as stock changes in forests. To that end, IPCC has created guidelines, methods and default values for all parameters needed to assess carbon stocks and their changes in forests (IPCC, 2003). It has thus furnished all countries with the means of estimating and reporting carbon stocks, greenhouse gas emissions and removals, irrespective of the availability of country-specific data. Striving for synergies and for streamlined country reporting to international organizations, FAO incorporated the IPCC guidelines on assessment of carbon stocks in forests into its guidelines for country reporting for FRA 2005.

Reporting on carbon stocks in forests under the UNFCCC, the Kyoto Protocol and to FAO may overlap, but are not necessarily identical. For FRA 2005, countries reported *carbon stocks* for the years 1990, 2000 and 2005. The UNFCCC mandates reporting *carbon stock changes*. However, in one of its methods, IPCC estimates net emissions of carbon as the difference between periodic carbon stocks.

In a further difference, UNFCCC members report on 'managed forests' only. The convention does not define 'forest' or managed forest. However, IPCC considers managed forests as "all forests under direct human influence" or "forests subject to the process of planning and implementing practices for stewardship and use aimed at fulfilling relevant ecological, economic and social functions" (IPCC, 2003). Given this broad definition, many countries may classify all their forests as managed forests. However, only by assuming both a steady state of biomass in 'unmanaged forests' and identical definitions of 'forest' will *carbon stock changes* be the same under the two reporting systems. Even in this case, estimates of the total *carbon stock* may still differ, depending on whether all forests are included or not in reporting under the UNFCCC.

Quantifying the substantial roles of forests as carbon stores, as sources of carbon emissions and as carbon sinks has become one of the keys to understanding and modifying the global carbon cycle. Global forest resources assessments have the potential to contribute to or substantiate estimates of the magnitude of stocks and flows by scientific bodies such as IPCC. Simultaneously, they complement and facilitate international reporting by countries on greenhouse gas emissions and removals under the UNFCCC.

Information availability

By integrating IPCC guidance into the guidelines for country reporting for FRA 2005, FAO sought to facilitate complete reporting on biomass and carbon pools by all countries. Yet many of the 229 countries and territories had difficulty in providing complete information for all pools of carbon, i.e. above- and below-ground biomass, dead wood, litter and soil carbon to a depth of 30 cm.

With few exceptions, countries that reported growing stock also successfully transformed this data into above- and below-ground biomass and then to carbon stock in forest biomass (Figure 2.11). Many countries based the conversion from growing stock to biomass on the IPCC good practice guidance factors (IPCC, 2003), reflecting a lack of country-specific biomass expansion factors.

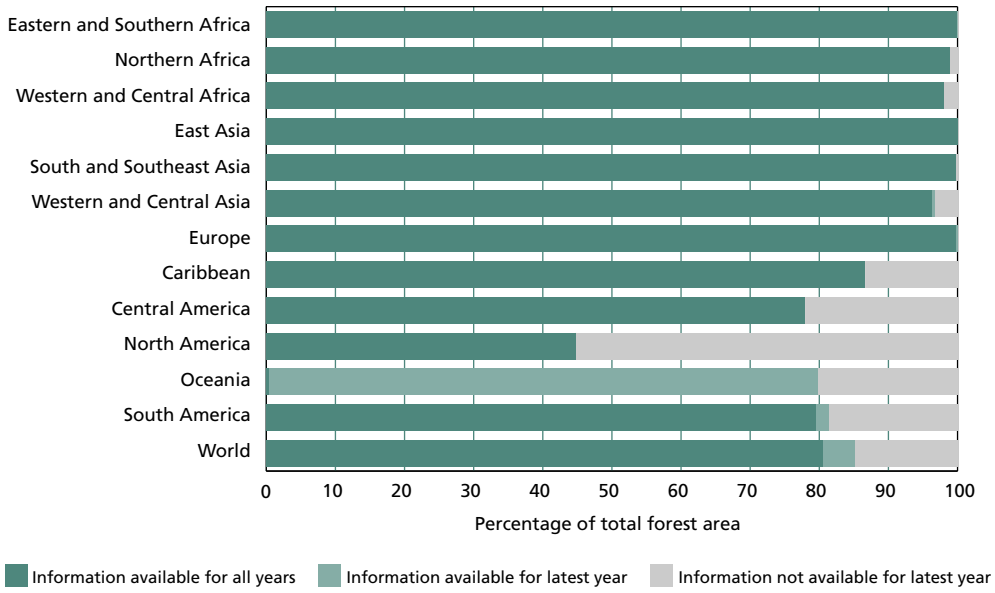
Of the 151 countries that reported on forest biomass:

- 87 have used the IPCC good practice guidance biomass expansion factors exclusively;
- 41 have used the IPCC factors in combination with factors from other sources;
- 13 have used national data – either direct estimates or national expansion factors;
- 5 have used factors/models from FAO and FAO/UNECE publications;
- 5 are based on expert estimates.

Response rates for carbon pools other than forest biomass decreased steeply, to merely 20 percent of the countries, representing 51 percent of the total forest area for soil carbon.

It is clear that many countries do not possess country-specific information on the parameters necessary for calculating all carbon pools. However, perhaps blanks in

FIGURE 2.11
Information availability – carbon stock in forest biomass



the reporting tables also reflect political concerns, institutional and human capacity for reporting, or difficulties with the IPCC guidelines. Response rates for carbon in biomass were high from developing countries in all subregions except the Caribbean, while some large industrialized countries in North America and Oceania did not report biomass and carbon data at all or only incompletely, because they are currently in the process of finalizing their overall carbon inventories.

Overall, this report assesses carbon in all pools based on a fairly representative fraction of over half the global forest area for all components and more than 80 percent of total forest area for carbon in forest biomass.

Although countries were asked to provide information on carbon in forest soils in the top 30 cm, some countries used other threshold values. In these cases, the figures were adjusted to the common threshold of 30 cm.

Status

Carbon stock per hectare. Table 2.8 provides forest-area-weighted average carbon stocks per hectare for biomass, dead wood, litter and soils by region for the year 2005. Biomass and dead wood account for 44 and 6 percent of total forest ecosystem carbon respectively, while soils to a depth of 30 cm and litter contribute approximately 46 and 4 percent respectively.

Carbon stocks in forest biomass reach the highest values per hectare in Central and South America and Western and Central Africa, while East Asia, Northern Africa and Western and Central Asia report the lowest values.

IPCC (2000) estimated an average carbon stock of 86 tonnes per hectare in the vegetation of the world's forests for the mid-1990s. The corresponding carbon in biomass and dead wood in forests reported here amounts to 82 tonnes per hectare for the year 1990 and to 81 tonnes per hectare for the year 2005.

Each cubic metre of growing stock equals different amounts of biomass and carbon in biomass in the regions. Table 2.9 provides average conversion factors compiled from country submissions. Globally, each cubic metre of growing stock equals, on average, 1 tonne of above-ground biomass, 1.3 tonnes of total biomass and 0.7 tonnes of carbon in biomass.

TABLE 2.8
Carbon stock per hectare 2005 *(tonnes/ha)*

Region/subregion	Carbon in living biomass	Carbon in dead wood	Carbon in litter	Carbon in soil	Total carbon
Eastern and Southern Africa	63.5	7.5	2.1		73.0
Northern Africa	26.0	3.3	2.1	33.5	64.9
Western and Central Africa	155.0	9.8	2.1	56.0	222.9
Total Africa	**95.8**	**7.6**	**2.1**	**55.3**	**160.8**
East Asia	37.0	5.0			41.9
South and Southeast Asia	77.0	9.0	2.7	68.4	157.1
Western and Central Asia	39.7	3.6	11.4	41.0	95.8
Total Asia	**57.0**	**6.9**	**2.9**	**66.1**	**132.9**
Total Europe	**43.9**	**14.0**	**6.1**	**112.9**	**176.9**
Caribbean	99.7	8.8	2.2	70.5	181.2
Central America	119.4	14.4	2.1	43.3	179.2
North America	57.8	8.8	15.4	35.8	117.8
Total North and Central America	**60.1**	**9.0**	**14.8**	**36.6**	**120.6**
Total Oceania	**55.0**	**7.4**	**9.5**	**101.2**	**173.1**
Total South America	**110.0**	**9.2**	**4.2**	**71.1**	**194.6**
World	**71.5**	**9.7**	**6.3**	**73.5**	**161.1**

TABLE 2.9
Average factors for estimating biomass and carbon from growing stock

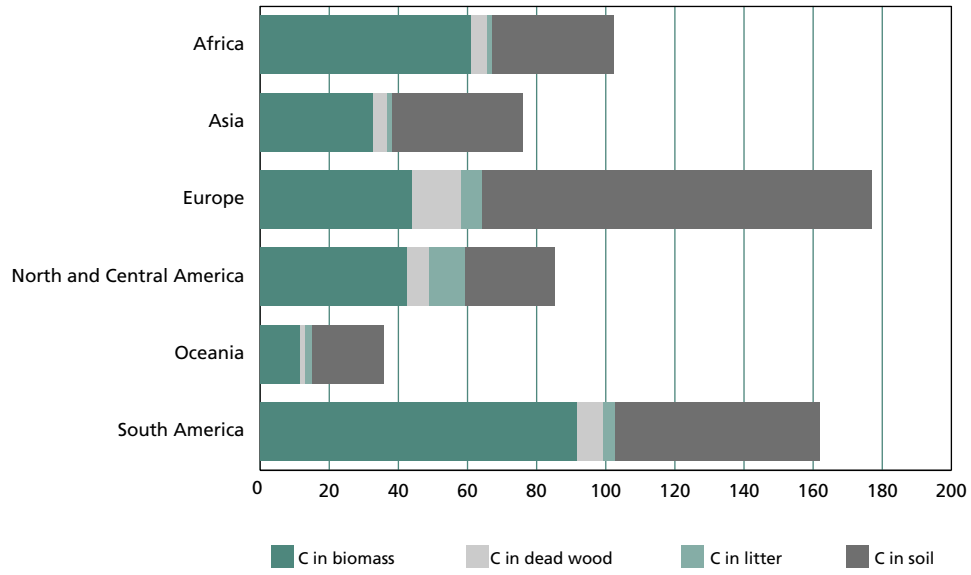
Region/subregion	1 m³ of growing stock represents:		
	Tonnes of above-ground biomass	Tonnes of total biomass	Tonnes of carbon in biomass
Eastern and Southern Africa	2.3	2.9	1.4
Northern Africa	2.1	2.7	1.4
Western and Central Africa	1.3	1.7	0.8
Total Africa	**1.5**	**1.9**	**0.9**
East Asia	0.7	0.9	0.5
South and Southeast Asia	1.4	1.8	0.9
Western and Central Asia	0.9	1.1	0.5
Total Asia	**1.1**	**1.4**	**0.7**
Total Europe	**0.7**	**0.8**	**0.4**
Caribbean	2.0	2.6	1.2
Central America	1.4	1.8	0.9
North America	1.0	1.1	0.5
Total North and Central America	**1.0**	**1.2**	**0.5**
Total Oceania	**1.4**	**2.0**	**1.0**
Total South America	**1.1**	**1.5**	**0.7**
World	**1.0**	**1.3**	**0.7**

Note: soil carbon to 30 cm depth.

Total carbon stock. As a consequence of missing data, it is not possible to sum country data to obtain complete regional or global totals for carbon in any pool. Yet, in the context of climate change, these totals and their changes over the years are beyond mere academic interest. Figure 2.12 shows estimated total carbon stock for all pools by region. The figures were obtained by expanding reported data through the use of subregional estimates of carbon per hectare of forest, multiplied by the total forest area for each subregion.

The country reports indicate that global forest vegetation stores 283 Gt of carbon in its biomass, and an additional 38 Gt in dead wood, for a total of 321 Gt. A prior estimate

FIGURE 2.12
Total carbon stock (C) in forests by region 2005
(Gt)



by IPCC (2000) assumed 359 Gt of carbon in these pools. An assumed amount in FRA 2005 of only 10 tonnes per hectare of carbon in dead wood, on average, probably represents an underestimate and might be one reason for the discrepancy between the IPCC and country reports. Another may be exclusion of the biomass of undergrowth by some countries.

Soils (down to 30 cm) and litter contain 317 Gt of carbon according to country estimates in this assessment. There are large data gaps for major boreal forests with typically large amounts of soil carbon; thus the figures are likely underestimates.

The total carbon content of forest ecosystems for the year 2005 is, therefore, 638 Gt of carbon, which is more than the amount of carbon in the entire atmosphere. Roughly half of total carbon is found in forest biomass and dead wood combined, and half in soils and litter combined.

Trends

From 1990 to 2005, carbon in biomass decreased in Africa, Asia and South America, remained approximately constant in Oceania and increased in Europe and in North and Central America. Not all subregions followed this trend. Thus total biomass carbon stocks increased in East Asia and in Western and Central Asia, and decreased in Central America (Table 2.10). The decrease in overall biomass carbon stocks since 1990 was driven by South and Southeast Asia (33 percent decrease), Western and Central Africa (7 percent) and South America (6 percent).

If an average change of total biomass carbon stocks of at least 0.5 percent per year is defined as significant, then of a total of 146 countries and territories, 42 reported decreases, 55 increases and 49 reported no significant change in total carbon stocks within forest biomass.

In interpreting the reliability and meaning of these results, it is helpful to examine carbon stocks per hectare concurrently. Based on the same significance level, 99 countries reported no substantial change of carbon stock per hectare for the 1990–2005 period, 11 countries reported a decrease and 36 countries an increase.

TABLE 2.10
Trends in carbon stocks in forest biomass 1990–2005

Region/subregion	Carbon in living biomass (Gt)		
	1990	2000	2005
Eastern and Southern Africa	15.9	14.8	14.4
Northern Africa	3.8	3.5	3.4
Western and Central Africa	46.0	43.9	43.1
Total Africa	**65.8**	**62.2**	**60.8**
East Asia	7.2	8.4	9.1
South and Southeast Asia	32.3	25.5	21.8
Western and Central Asia	1.6	1.7	1.7
Total Asia	**41.1**	**35.6**	**32.6**
Total Europe	**42.0**	**43.1**	**43.9**
Caribbean	0.4	0.5	0.6
Central America	3.4	2.9	2.7
North America	37.2	38.5	39.2
Total North and Central America	**41.0**	**41.9**	**42.4**
Total Oceania	**11.6**	**11.4**	**11.4**
Total South America	**97.7**	**94.2**	**91.5**
World	**299.2**	**288.6**	**282.7**

Of the 42 countries communicating significant declines in total carbon stocks in forest biomass, only 17 percent also described lower levels of carbon stocks per hectare. In contrast, 78 percent – overwhelmingly developing countries – presumed virtually identical carbon stocks per hectare at the beginning and end of the 15-year period. In these countries, therefore, a reduction in total carbon stock in forest biomass reflects a net loss of forest area. Of the 20 countries reporting the highest absolute reduction in carbon stock, 15 did not report decreases in carbon stock per hectare. Essentially all the carbon stock reduction, therefore, is due to a net loss of forest area. Of the two countries with the highest decrease in carbon stocks, Brazil and Indonesia, only Indonesia recorded a significantly lower level of carbon per hectare in 2005, indicating that not only the forest area but also the biomass and carbon stock per hectare had decreased.

In contrast, of all countries reporting significant total carbon stock increases (mainly Chile, China, many European countries, India, Japan and the United States), 67 percent also documented substantially higher levels of carbon stock per hectare, indicating a higher likelihood that stocks were actually assessed more than once. For 25 percent of these countries, carbon stocks per hectare remained essentially the same, pointing to an increase in forest area as the main reason for increased total stocks.

Chapter 3
Biological diversity

OVERVIEW

'Biological diversity' encompasses the variety of existing life forms, the ecological roles they perform and the genetic diversity they contain (FAO, 1989). In forests, biological diversity allows species to adapt continuously to dynamically evolving environmental conditions, to maintain the potential for tree breeding and improvement (to meet human needs for goods and services and changing end-use requirements), and to support their ecosystem functions.

While timber production often dominated the way in which forests were managed in the twentieth century, new pressures in the twenty-first century drive a more balanced approach, calling for delivery of multiple goods and services. The process towards sustainable forest management is now considered consistent with the conservation of biological diversity.

Assessing, monitoring and reporting on biological diversity are important activities aimed at guiding sustainable forest management. Monitoring of biological diversity and of the changes caused by forestry practices is important in assessing the effectiveness of management and the cumulative changes brought about by forest use. However, there are conceptual and practical difficulties in doing so. These are not unique to biological diversity *per se*, but are general inventory problems related to target parameters that are complex and highly variable.

The values derived from biological diversity are associated with different scales that require different assessment methodologies. These include ecosystems, landscapes, species, populations, individuals and genes. Varying and complex interactions exist among all these levels.

Because biological diversity encompasses the complexity of all life forms, assessment and monitoring are only possible for specific aspects or particular, defined goals. There is no single, objective measure of biological diversity, only proxy measures appropriate for specified and, by necessity, restricted purposes. Species richness, for example, has a very wide natural variation from boreal to tropical forests. For policy and monitoring purposes, it is the change in biodiversity that is important, which implies identifying a few relevant indicators and then monitoring them over time. So far this has not been achieved for forest ecosystems on a wide scale (i.e. national or continental), but FRA 2005 has attempted to establish a baseline for forest ecosystems worldwide, and to provide input into wider biodiversity monitoring work.

Most local forest inventories are conducted to estimate harvestable volumes of wood and sometimes non-wood forest products, rather than to monitor biological diversity. An immediate need exists to categorize and substantially improve the understanding of biological diversity with a view to measuring trends, particularly on regional scales. In this respect, the work carried out in the framework of criteria and indicators processes, which all address biological diversity, is an important contribution.

The variables measured in FRA 2005 with relevance to forest biological diversity include:

- area of primary forests;
- forest area designated for conservation of biodiversity;
- composition of forests;
- number of native tree species;
- threatened forest tree species.

These variables include measures both of policy response (e.g. areas designated for conservation of biodiversity) and of outcome (e.g. number of threatened species). Both are needed, but the fundamental difference between these two concepts should be borne in mind.

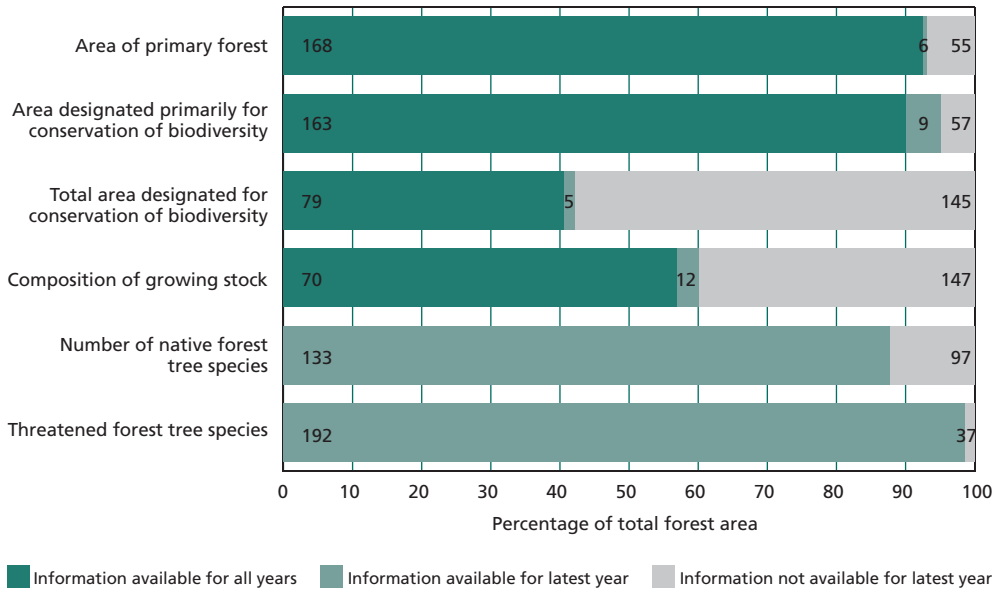
In recent years, the Global Forest Resources Assessments have increased their focus on forest biodiversity. FRA 2005 gathered and compiled relevant information at landscape and species levels, while addressing some structural and compositional aspects. At the ecosystem level, FRA 2005 provides information on the area of forests and – more specifically – on the area of primary and other forests managed for the conservation of biological diversity (including protected areas), thus complementing FRA 2000 data on the proportion of forests in protected areas. At the species level, FRA 2000 highlighted the global lack of estimates of the number of tree species by country, with the exception of endangered tree species. FRA 2005 thus focused on assessment of the number of both native and endangered forest tree species at the country level. In addition, country reports included lists of the ten most common tree species (measured by their share of total growing stock), thus providing important information on the tree species composition of forests.

Many countries lack the capacity to report on biological diversity. In particular, there is generally less knowledge with respect to biological diversity in tropical forests compared with the other biomes. In FRA 2005, countries were better able to report on the area of primary forest, on forest area designated for the conservation of biodiversity and on threatened tree species than on the other variables reported in this chapter (Figure 3.1). However, these data alone are insufficient to provide a reliable picture of broader trends in forest biological diversity.

KEY FINDINGS

Although a large number of countries have reported on the characteristics of their forests, information on the area of primary forest is not readily available. Proxy values have often been used, including the area of natural forest over a certain age or the area of forest with protected area status. This makes a detailed analysis of status and trends difficult. The

FIGURE 3.1
Information availability – biological diversity



Note: Figures present number of countries in each category.

results suggest, however, that the total area of primary forests exceeds 1.3 billion hectares or 36 percent of all forests, and that the ten countries with the largest area of primary forest account for 88.2 percent of the total area of primary forest in the world.

Information was unavailable for many of the countries in the Congo Basin, the second largest expanse of tropical forest, which should be kept in mind when analysing the findings.

Great variation exists in terms of the distribution of primary forest, with limited areas reported from the Caribbean, Eastern and Southern Africa, Europe (not including the Russian Federation), North Africa and the arid zones of Western and Central Asia. The largest expanse of primary forest is found in South America (the Amazon Basin). Countries in North and Central America and the Russian Federation have also classified a relatively high proportion of their forests as primary.

The estimated annual net decrease in primary forests of 6 million hectares is alarmingly high. This decrease reflects not only a complete loss of these forests, but also changes within the forest, for instance when primary forests move into the category of modified natural forests due to selective logging. Some countries, notably in Europe and Japan, are reporting an increase in their areas of primary forests, because natural forests have been set aside as 'no intervention' areas.

In 2005, globally, more than 400 million hectares of forests, or 11 percent of total forest area, were designated for the conservation of biological diversity as the primary function. The area of forest devoted to conservation of biodiversity has increased by at least 96 million hectares, or 32 percent, since 1990. This increasing trend is evident in all regions and subregions except Northern, Eastern and Southern Africa.

Information on the total area of forest that has conservation of biological diversity designated as *one* of the functions and management objectives is of considerable interest to the forest conservation community, but information was lacking from many countries. To improve the potential value of this variable, it would be worth refining and simplifying its estimation. This might improve the level of reporting, which was especially low in Africa and Oceania.

Forest composition is a valuable indicator of biological diversity. Although a significant number of countries reported on the composition of their forests in terms of growing stock, information was unavailable for many countries, which makes a detailed analysis of the value of the indicator difficult.

There is also great variation in terms of forest tree species diversity, from limited numbers of individual species in boreal ecosystems to high species richness per area unit in Central and South America, South and Southeast Asia, and Western and Central Africa. Boreal forests tend to harbour the lowest species diversity. On average, the ten most common tree species in a country account for 76 percent of total growing stock. The exceptions by region are found in Central America, South and Southeast Asia and Western and Central Africa, where percentages range from 22 to 47 percent. In Europe and Western and Central Asia, the ten most common tree species account for more than 90 percent of total growing stock.

Information was missing from many countries in South America (including Brazil) and from most of the countries in the Congo Basin, both areas of known high species diversity.

The combined list of the ten most common tree species from all countries contained 445 different species. Five genera (*Pinus, Quercus, Picea, Abies* and *Fagus*) make up almost one-third of the number of species reported as being most common. This may be influenced by the fact that Asia and Europe are over-represented, in terms of the number of countries that reported on this topic, relative to their total forest area. No change in the relative importance of different species was found between 1990 and 2000; nor were major changes noticed in the share of growing stock occupied by the three most common species.

In terms of the status of native tree species, South America displays a higher number of threatened tree species than other regions, with the lowest number being found in Europe. Countries in South and Southeast Asia also report a significantly higher number of endangered and critically endangered species. Forty-five countries report that they have no threatened tree species.

The overall high response rate on threatened species reflects the availability of the global *IUCN 2000 red list of threatened species* (IUCN, 2000) – although 53 countries and areas reported discrepancies with this list. It also demonstrates a clear perception that significant numbers of forest tree species are threatened.

On average, 5 percent of the tree species native to a country are either vulnerable, endangered or critically endangered.

In conclusion, FRA 2005 data confirm that forest biodiversity conservation concerns have encouraged significant policy responses and, in particular, the setting aside of increasing areas of forest for conservation purposes. FRA 2005 has established a tentative baseline for further monitoring work at landscape and species levels. The monitoring of a few selected outcome indicators, to be determined, should in the future help in reviewing the effectiveness, at the country level, of the implementation of policy decisions on biodiversity conservation.

PRIMARY FORESTS

Information on total forest area, forest characteristics and overall changes in both over time was presented in Chapter 2, Extent of forest resources. The present chapter focuses on primary forests, which are defined in FRA 2005 as forests of native species, in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed.

Primary forests are often equated with high levels of biodiversity, but this is not always the case. In the temperate and boreal zones, for example, they can be poor in terms of number of plant and animal species, while some modified natural or semi-natural forests and forests bordering agricultural areas may provide additional habitats and thus harbour more species. Nevertheless, the size of the area of primary forest is one of several important indicators of the state of forest ecosystems.

It should also be kept in mind that primary forests fulfil many essential functions other than the conservation of biological diversity: soil and water conservation, carbon sequestration and the preservation of aesthetic, cultural and religious values.

Information availability

The 174 countries reporting on area of primary forest account for 93.1 percent of total forest area. Information is missing, unfortunately, from many of the smaller islands and territories and from many of the countries in the Congo Basin, the second largest expanse of tropical forest (Figure 3.2).

Of the reporting countries, only 96 reported that they had any primary forest left in 2005. Several others reported that they had insufficient information on the area of primary forests. Few of those who did include an estimate had exact information. Many used the current area of forests in national parks and other protected areas as a proxy value or provided an expert estimate of the percentage of natural forests that could be considered primary according to the FRA 2005 definition.

These shortcomings should be kept in mind when referring to the findings below.

Status

Information on the current and past extent of primary forest in each of the countries reporting on this variable can be found in Table 9 in Annex 3. A regional summary follows.

An estimated 1.3 billion hectares of forest – or 36.4 percent of the combined forest area of the reporting countries – are considered primary forest (Table 3.1).

FIGURE 3.2
Information availability – area of primary forest

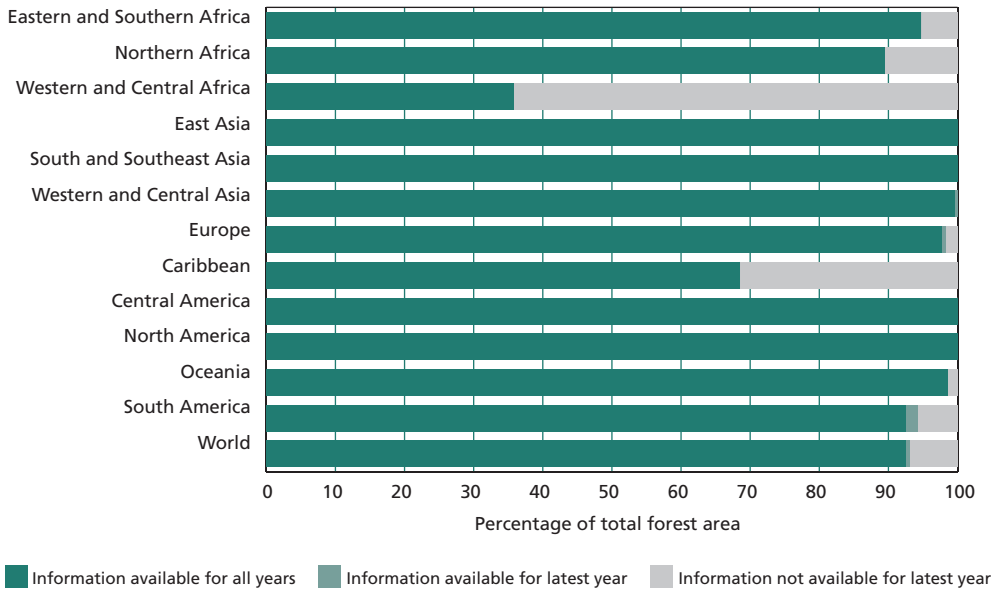


TABLE 3.1
Area of primary forest 2005

Region/subregion	Information availability			Area of primary forest *(1 000 ha)*	Primary forest as % of total forest area	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area		Average	Range
Eastern and Southern Africa	18	214 589	94.7	12 241	5.7	0-81
Northern Africa	12	117 193	89.4	13 919	11.9	0-20
Western and Central Africa	17	99 566	35.8	11 510	11.6	0-45
Total Africa	**47**	**431 347**	**67.9**	**37 669**	**8.7**	**0-81**
East Asia	5	244 862	100.0	21 808	8.9	6-46
South and Southeast Asia	17	283 126	100.0	62 908	22.2	1-100
Western and Central Asia	23	43 579	100.0	2 810	6.4	0-72
Total Asia	**45**	**571 567**	**100.0**	**87 526**	**15.3**	**0-72**
Total Europe	**36**	**983 907**	**98.3**	**263 948**	**26.8**	**0-32**
Caribbean	12	4 090	68.5	60	1.5	6-59
Central America	7	22 411	100.0	9 139	40.8	2-70
North America	4	677 464	100.0	302 456	44.6	34-53
Total North and Central America	**23**	**703 965**	**99.7**	**311 656**	**44.3**	**2-70**
Total Oceania	**11**	**203 455**	**98.6**	**35 275**	**n.s.**	**n.s.-89**
Total South America	**12**	**783 827**	**94.3**	**601 689**	**76.8**	**10-96**
World	**174**	**3 678 069**	**93.1**	**1 337 763**	**36.4**	**0-100**

Forty-five percent of the total area of primary forest reported is found in South America, followed by North and Central America (23.3 percent) and Europe (19.7 percent – almost all of it in the Russian Federation).

The ten countries with the largest area of primary forest account for 89.1 percent of the total area of primary forest in the world (Figure 3.3).

Twenty countries report that their primary forest is at least 50 percent of their total forest area, and ten countries have classified more than 80 percent of their forests as primary (Table 3.2).

FIGURE 3.3
Ten countries with largest area of primary forest 2005
(%)

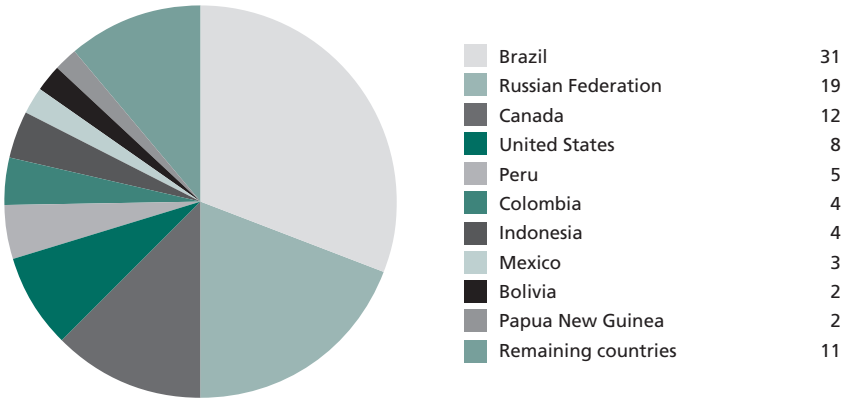


TABLE 3.2
Ten countries with highest percentage of primary forest 2005

Country	Primary forest as % of total forest
Brunei Darussalam	100
Singapore	100
French Guiana	96
Suriname	96
Fiji	89
Peru	89
Colombia	87
Brazil	87
Papua New Guinea	86
Madagascar	81

Of the reporting countries and areas, 28 countries, mostly in Europe and in the arid zones of Africa and Western Asia, reported that they have no primary forests left, and 50 provided no information on the area of primary forest. In some cases, this may be due to lack of data rather than complete lack of primary forest.

Trends

A trend analysis was generated based on those countries reporting for 2005, including those reporting that they had no primary forest. For eight countries for which information was missing for 1990 (Australia, Bosnia and Herzegovina, Burundi, Estonia, Guyana, Latvia, Lebanon and Samoa), FAO employed a linear extrapolation based on the estimates for 2005 and 2000. While the proportion of total forest classified as primary has remained fairly constant since 1990, indications are that primary forests were lost at an average rate of 6 million hectares per year over the last 15 years and that the rate of loss is slowing down in some regions, but is increasing in South America.

This estimated net loss excluded the Russian Federation, where a large difference in the change rate (from -1.6 million hectares per year in the 1990s to +0.5 million hectares per year in the last five years) is likely due to a modification in the methodology used rather than to actual changes.

Brazil and Indonesia alone accounted for an annual loss of primary forest of 4.9 million hectares during the period 2000–2005. The data received do not allow for an analysis of how large a proportion of this net loss is due to deforestation and conversion to other

uses and how much is due to the opening up of primary forests to selective logging and other human activities or to severe natural disasters, which could lead to some forests being classified as 'modified natural forests'.

A number of countries registered positive change rates in the area of primary forests (see Table 9 in Annex 3), including several western European countries and Japan. In most of these cases, the countries have been setting aside natural forest areas in which no intervention should take place. With time, these areas evolve into forests in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed, meeting the definition of primary forests used in FRA 2005. For example, Japan and some of the European countries classified all natural forests over a certain age or size as primary forests if no interventions had been conducted over the last 25 years.

FOREST AREA DESIGNATED FOR CONSERVATION OF BIODIVERSITY

The setting aside and management of land as protected areas is a key part of ongoing global efforts to conserve biological diversity. The amount of land set aside for conservation is an important indicator of progress, and the monitoring of this variable provides valuable information to conservation practitioners. The data on protected areas that were gathered, analysed and presented in FRA 1990 and 2000 are complemented by the data on area of forest designated for conservation in FRA 2005.

The primary global source of data is the World Database on Protected Areas (WDPA), which is managed by the World Conservation Monitoring Centre (WCMC) of the United Nations Environment Programme (UNEP) and funded by the WDPA Consortium. The WDPA and the analysis of the data it contains are useful in understanding global trends in protected areas.

FRA 1990 (FAO, 1993) presented data in a table entitled Distribution of protected areas. It documented the number of protected areas and the total area under protection in developing countries in Africa, Asia and Latin America and in developed countries in Asia, Europe, the former Union of Soviet Socialist Republics (USSR), North America and Oceania.

FRA 2000 (FAO, 2001b) presented regional and global data on forests in protected areas and on the proportion of forest in protected areas in tropical, subtropical, temperate and boreal zones. The estimate in FRA 2000 that 12.4 percent of total forest area was in protected areas was of obvious interest. The relatively low proportion of boreal forest in protected areas was also significant. These findings should be compared with the contemporary World Wide Fund for Nature (WWF)/IUCN goal of establishing an ecologically representative network of protected areas covering at least 10 percent of the world's forest area by the year 2000 (WWF and IUCN, 1998).

For FRA 2005, information was requested from countries and areas on two measures of the area designated for conservation of biodiversity:

- forest area designated primarily for conservation of biodiversity;
- total forest area designated for conservation of biodiversity.

Areas designated for conservation of biodiversity, whether as the primary or a subsidiary function, include areas outside protected areas. At the same time, some forests in protected areas may be designated for the conservation of soil and water resources or a cultural heritage. So the estimated area of forest designated for conservation of biodiversity is not necessarily equivalent to the area of forest in protected areas.

Information availability

For FRA 2005, Figures 3.4 and 3.5 show that there was a striking difference in all regions in the percentage of countries or areas that provided information on the two measures of the area of forest designated for conservation of biological diversity.

A plausible explanation for the large difference in response rates is that the calculation of the total area designated for conservation is rather complex and different methodologies

FIGURE 3.4
Information availability – area of forest designated primarily for conservation of biodiversity

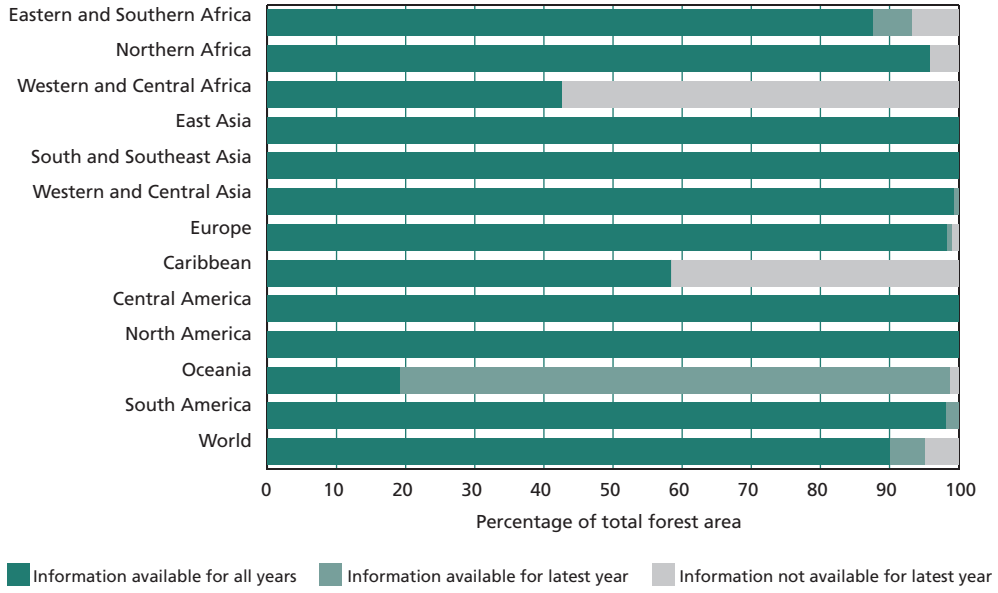
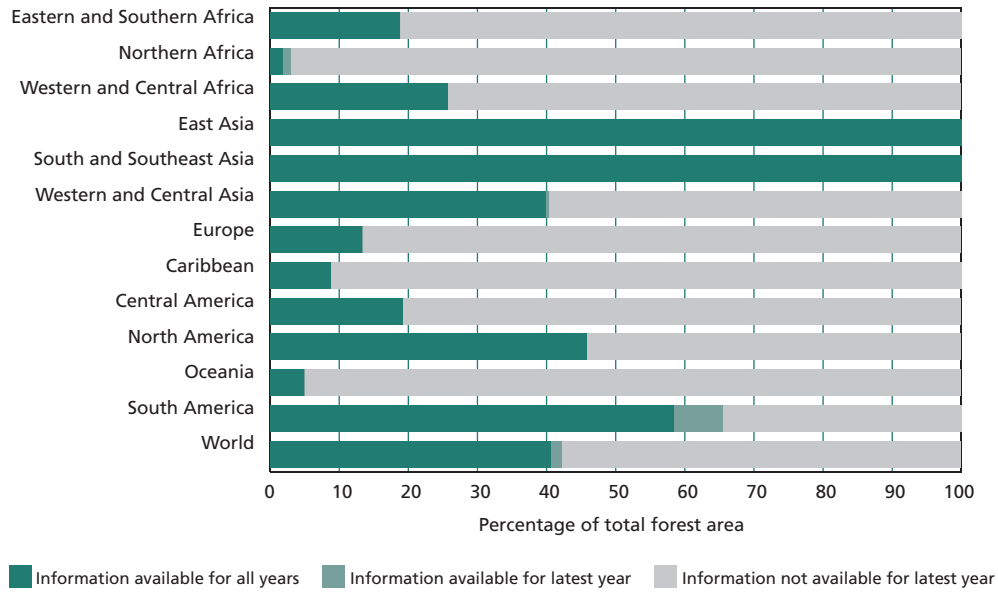


FIGURE 3.5
Information availability – total area of forest designated for conservation of biodiversity



are used at the national level. In Africa, eight forest-rich countries, accounting for 62 percent of the continent's total forest cover, did not report on this measure. As a result, the estimate of the total area designated for conservation was less than half that of the area with conservation as the primary function, which is an anomalous result.

In South America, on the other hand, although only three out of 15 countries and areas reported on this measure, they account for 69 percent of the continent's total forest

area. The estimate of the total area designated for conservation was nearly three times the area having conservation as the primary function, which is consistent with what would logically be expected.

Status

The data provided by countries on forest area designated primarily for biodiversity conservation show that, globally, more than 400 million hectares of forest – or 11.2 percent of total forest area of the reporting countries – are designated as having conservation of biodiversity as their primary function (Table 3.3).

The biggest area of forest designated for conservation of biodiversity is found in South America, followed by North America, while Central America and Western and Central Africa have the highest percentage of their forests designated primarily for conservation. Europe and Western and Central Asia have the lowest percentage of forests designated primarily for conservation.

Although the percentage of forest designated primarily for conservation is not exactly equal to the percentage of forest in protected areas, many countries used the area of forests in protected areas as a proxy value. It is thus not surprising to find that the global figure for this measure, 11.2 percent, is not significantly different from the estimate in FRA 2000 of the percentage of forest in protected areas, which was 12.4 percent.

The total area of forest designated for conservation is an interesting measure (Table 3.4) because it gives an indication of the area in which conservation is a consideration in land management, without necessarily being the priority, as might often be the case outside protected areas. It is logical to expect that this area will be larger than the area in which conservation is the primary function.

A comparison of Tables 3.3 and 3.4 confirms the expectation that the area designated for conservation would be larger than the area with conservation designated as the primary function. This comparison must be treated with caution, however, owing to the low response rates in Africa, Europe and Oceania for this variable.

Trends

For FRA 2005, countries were asked to make retrospective estimates for 1990 and 2000 for the two measures of forest area designated for conservation.

TABLE 3.3
Area of forest designated primarily for conservation of biodiversity 2005

Region/subregion	Information availability			Area designated primarily for conservation	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	16	211 181	93.2	20 158	9.5
Northern Africa	13	125 667	95.9	13 036	10.4
Western and Central Africa	15	118 280	42.6	41 390	35.0
Total Africa	**44**	**455 129**	**71.6**	**74 585**	**16.4**
East Asia	5	244 862	100.0	11 479	4.7
South and Southeast Asia	17	283 126	100.0	57 290	20.2
Western and Central Asia	23	43 579	100.0	2 772	6.4
Total Asia	**45**	**571 567**	**100.0**	**71 541**	**12.5**
Total Europe	**36**	**991 192**	**99.0**	**37 776**	**3.8**
Caribbean	9	3 489	58.4	704	20.2
Central America	7	22 411	100.0	8 482	37.8
North America	4	677 464	100.0	79 741	11.8
Total North and Central America	**20**	**703 364**	**99.6**	**88 927**	**12.6**
Total Oceania	**14**	**203 467**	**98.6**	**29 366**	**14.4**
Total South America	**13**	**831 540**	**100.0**	**119 742**	**14.4**
World	**172**	**3 756 260**	**95.0**	**421 936**	**11.2**

TABLE 3.4
Total area of forest designated for conservation of biodiversity 2005

Region/subregion	Information availability			Total area designated for conservation	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	3	42 529	18.8	10 272	24.2
Northern Africa	3	3 876	3.0	1 380	35.6
Western and Central Africa	6	71 350	25.7	27 150	38.1
Total Africa	**12**	**117 754**	**18.5**	**38 802**	**33.0**
East Asia	5	244 862	100.0	119 078	48.6
South and Southeast Asia	17	283 126	100.0	147 298	52.0
Western and Central Asia	12	17 507	40.2	8 580	49.0
Total Asia	**34**	**545 495**	**95.4**	**274 955**	**50.4**
Total Europe	**22**	**133 854**	**13.4**	**88 219**	**65.9**
Caribbean	3	524	8.8	130	24.9
Central America	1	4 294	19.2	2 827	65.8
North America	2	310 137	45.8	310 135	100.0
Total North and Central America	**6**	**314 955**	**44.6**	**313 092**	**99.4**
Total Oceania	**7**	**10 235**	**5.0**	**8 719**	**85.2**
Total South America	**3**	**544 501**	**65.5**	**318 335**	**58.5**
World	**84**	**1 666 795**	**42.2**	**1 042 122**	**62.5**

TABLE 3.5
Trends in area of forest designated primarily for conservation of biodiversity 1990–2005

Region/subregion	Information availability (all 3 years)			Area of forest designated *(1 000 ha)*			Annual change rate *(%)*	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	2005	1990–2000	2000–2005
Eastern and Southern Africa	15	198 343	87.6	15 294	15 165	15 101	-0.08	-0.08
Northern Africa	13	125 667	95.9	14 441	13 515	13 036	-0.66	-0.72
Western and Central Africa	15	118 280	42.6	37 068	37 232	41 390	0.04	2.14
Total Africa	**43**	**442 291**	**69.6**	**66 803**	**65 912**	**69 528**	**-0.13**	**1.07**
East Asia	5	244 862	100.0	10 338	10 847	11 479	0.48	1.14
South and Southeast Asia	17	283 126	100.0	46 725	52 540	57 290	1.18	1.75
Western and Central Asia	21	43 272	99.3	1 744	2 126	2 761	2.00	5.37
Total Asia	**43**	**571 259**	**99.9**	**58 807**	**65 513**	**71 531**	**1.09**	**1.77**
Total Europe	**34**	**984 468**	**98.3**	**18 402**	**33 877**	**36 760**	**6.29**	**1.65**
Caribbean	9	3 489	58.4	622	675	704	0.83	0.83
Central America	7	22 411	100.0	7 873	8 660	8 482	0.96	-0.42
North America	4	677 464	100.0	69 745	70 384	79 741	0.09	2.53
Total North and Central America	**20**	**703 364**	**99.6**	**78 240**	**79 720**	**88 927**	**0.19**	**2.21**
Total Oceania	**11**	**39 593**	**19.2**	**6 709**	**7 968**	**7 948**	**1.73**	**-0.05**
Total South America	**12**	**816 436**	**98.2**	**69 463**	**108 103**	**119 591**	**4.52**	**2.04**
World	**163**	**3 557 412**	**90.0**	**298 424**	**361 092**	**394 283**	**1.92**	**1.77**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in Table 3.3.

The estimates provided for the percentage of forest area designated primarily for conservation are summarized in Table 3.5. The figures in this table suggest that the area of forest devoted to biodiversity conservation has increased by at least 96 million hectares, or 32 percent, since 1990. This increasing trend is evident in all regions and subregions except Northern, Eastern and Southern Africa.

According to the 2003 *United Nations list of protected areas* (Chape *et al.*, 2003), which deals with all ecosystems, the area of land within protected areas grew by 53 percent from 1992 to 2003. The difference between this figure and the finding of FRA 2005 may be due to larger rates of increase in ecosystems other than forests.

TABLE 3.6
Trends in total area of forest designated for conservation of biodiversity 1990–2005

Region/subregion	Information availability (all 3 years)			Area of forest designated *(1 000 ha)*			Annual change rate *(%)*	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	2005	1990–2000	2000–2005
Eastern and Southern Africa	3	42 529	18.8	10 273	10 273	10 272	0	n.s.
Northern Africa	2	2 322	1.8	863	1 179	1 276	3.17	1.59
Western and Central Africa	6	71 350	25.7	23 628	24 005	27 150	0.16	2.49
Total Africa	**11**	**116 200**	**18.3**	**34 764**	**35 457**	**38 698**	**0.20**	**1.76**
East Asia	5	244 862	100.0	81 185	105 727	119 078	2.68	2.41
South and Southeast Asia	17	283 126	100.0	130 606	148 547	147 298	1.30	-0.17
Western and Central Asia	11	17 371	39.9	8 186	8 138	8 576	-0.06	1.06
Total Asia	**33**	**545 358**	**95.4**	**219 978**	**262 411**	**274 952**	**1.78**	**0.94**
Total Europe	**21**	**133 187**	**13.3**	**78 529**	**89 304**	**88 010**	**1.29**	**-0.29**
Caribbean	3	524	8.8	138	130	130	-0.60	0
Central America	1	4 294	19.2	2 754	2 857	2 827	0.37	-0.21
North America	2	310 137	45.8	310 137	310 137	310 135	0	n.s.
Total North and Central America	**6**	**314 955**	**44.6**	**313 029**	**313 124**	**313 092**	**n.s.**	**n.s.**
Total Oceania	**6**	**10 064**	**4.9**	**8 024**	**8 561**	**8 644**	**0.65**	**0.19**
Total South America	**2**	**485 761**	**58.4**	**137 695**	**180 623**	**259 595**	**2.75**	**7.52**
World	**79**	**1 605 526**	**40.6**	**792 018**	**889 481**	**982 990**	**1.17**	**2.02**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in Table 3.4.

The trends in the total area designated for conservation are summarized in Table 3.6. There was an estimated 24 percent increase in the world figure for total forest area designated for conservation between 1990 and 2005. However, the reliability of the estimate is reduced by the small areas reported for Africa, Europe and Oceania.

COMPOSITION OF FORESTS

Information on growing stock composition offers a proxy indicator that aids better understanding and monitoring of the dynamics of the relative abundance of forest tree species. The ten most common species in terms of growing stock have been listed and their contribution to total growing stock documented for 1990 and 2000. FRA 2005 attempts to estimate the rate of change of forest tree composition among the ten most abundant species, and to assess whether such information may be useful in documenting the factors implicated in these changes at the global level.

Information availability

Information on the species represented in growing stock is poor: only 82 countries and areas, accounting for 60 percent of total forest area, provided quantitative information on the ten most common species. Regions or subregions with the highest response rates were Asia, Europe and North America (Figure 3.6).

Status

Table 3.7 shows the percentage of growing stock of the three and the ten most common tree species.

The relative importance of growing stock of a species depends on many environmental and silvicultural factors. In natural and semi-natural forests, the percentage of growing stock represented by a given number of tree species is expected to be inversely correlated to tree species richness (and the number of tree species present in the area). Figure 3.7 shows that the percentage of growing stock occupied by the three most common tree species (native or introduced) is a reasonable predictor of the growing stock occupied by the ten most common (native or introduced) species at the country level.

FIGURE 3.6
Information availability – composition of growing stock

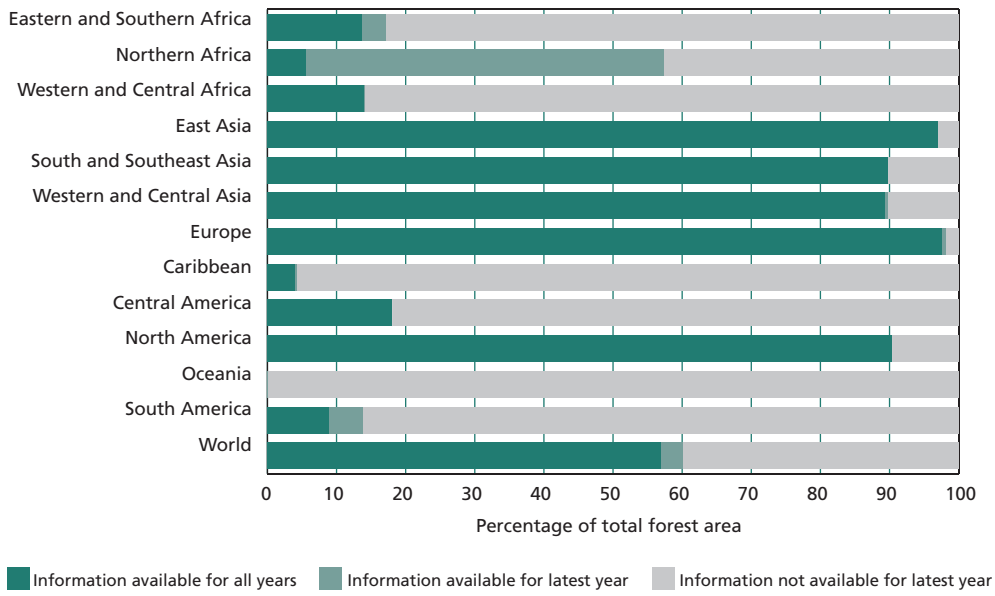
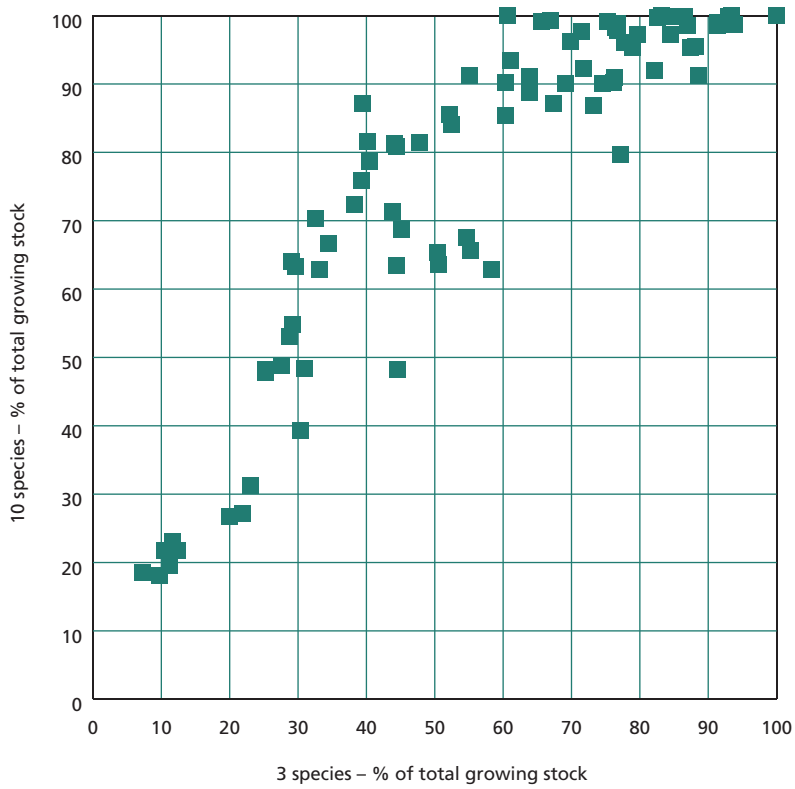


TABLE 3.7
Percentage of growing stock occupied by the most common tree species 2000

Region/subregion	Information availability			Three most common tree species			Ten most common tree species		
	Countries reporting	Forest area *(1 000 ha)*	% total forest area	Aver. % growing stock	Min. % growing stock	Max. % growing stock	Aver. % growing stock	Min. % growing stock	Max. % growing stock
Eastern and Southern Africa	6	40 294	17.1	54	12	100	69	23	100
Northern Africa	5	77 981	57.4	64	23	88	76	31	100
Western and Central Africa	5	40 129	14.1	24	10	44	43	18	71
Total Africa	**16**	**158 404**	**24.2**	**48**	**10**	**100**	**63**	**18**	**100**
East Asia	4	218 842	97.0	57	29	93	79	64	100
South and Southeast Asia	10	266 914	89.8	31	7	67	47	19	87
Western and Central Asia	11	39 062	89.7	77	60	94	94	80	99
Total Asia	**25**	**524 818**	**92.6**	**55**	**7**	**93**	**73**	**19**	**100**
Total Europe	**30**	**979210**	**98.1**	**70**	**34**	**93**	**92**	**65**	**100**
Caribbean	2	238	4.2	36	33	39	69	63	76
Central America	1	4 307	18.1	10	10	10	22	22	22
North America	2	612 428	90.3	29	25	33	59	48	70
Total North and Central America	**5**	**616 973**	**87.2**	**28**	**10**	**39**	**56**	**22**	**76**
Total Oceania	**2**	**44**	**0.0**	**41**	**38**	**44**	**77**	**72**	**81**
Total South America	**4**	**117 758**	**13.8**	**37**	**28**	**50**	**60**	**48**	**79**
World	**82**	**2 397 208**	**60.1**	**56**	**7**	**100**	**76**	**18**	**100**

Great variation exists in terms of species diversity, with limited numbers of individual species and high species richness per area unit in Central and South America, South and Southeast Asia and Western and Central Africa. Boreal forests of the Northern Hemisphere tend to harbour the lowest species diversity. At the country level, Congo, Viet Nam, Myanmar, Panama, Ghana, Madagascar, Indonesia and India (listed in ascending order) report that the ten most common tree species represent less

FIGURE 3.7
Average growing stock of the ten most common forest tree species as function of growing stock occupied by the three most common species[1]



[1] One square = one country/area.

than 30 percent of total growing stock, indicating high species diversity. Information was missing from many countries in South America (including Brazil) and from most countries in the Congo Basin, both areas of known high species diversity.

Figure 3.8 displays a loose relationship between two tree species diversity surrogates: total number of native tree species and growing stock composition. Introduced species are included in the data set for the growing stock composition.

Among the ten most common species, 445 different taxa have been reported by 88 countries. Asia and Europe are over-represented in the data set, which includes incomplete reports. A significant number of taxa were reported at the genus level without indication of species. Most countries provided Latin names. Five genera (*Pinus, Quercus, Picea, Abies* and *Fagus*) make up almost a third of the species reported. Figure 3.9 shows the distribution of the 25 most common genera, which represent 64 percent of all taxa reported.

Trends

Eighty-two countries provided time series (sometimes incomplete) on changes in the relative share of growing stock occupied by the ten main species from 1990 to 2000. No change in the relative ranking of tree species was observed in the data set. No significant change in the share of growing stock occupied by the three main species was seen in the data series from the 56 countries and areas providing complete series. In 1990 and 2000, this share accounted for 53 percent of growing stock, on average, although individual countries and areas varied by +/-5 percent.

FIGURE 3.8
Percentage of growing stock represented by the three most common forest tree species as function of number of native tree species

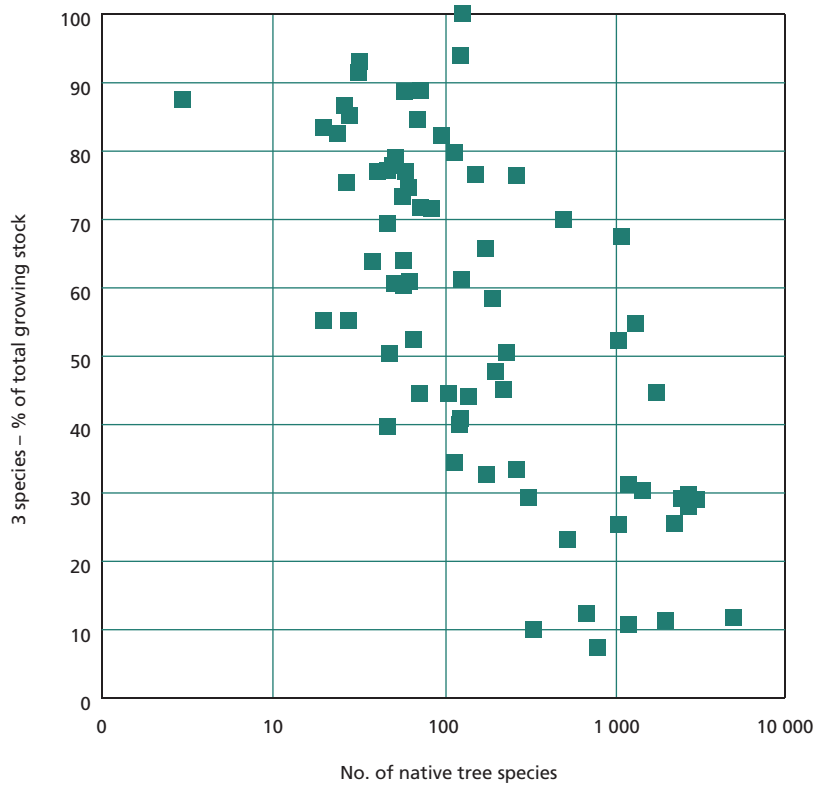
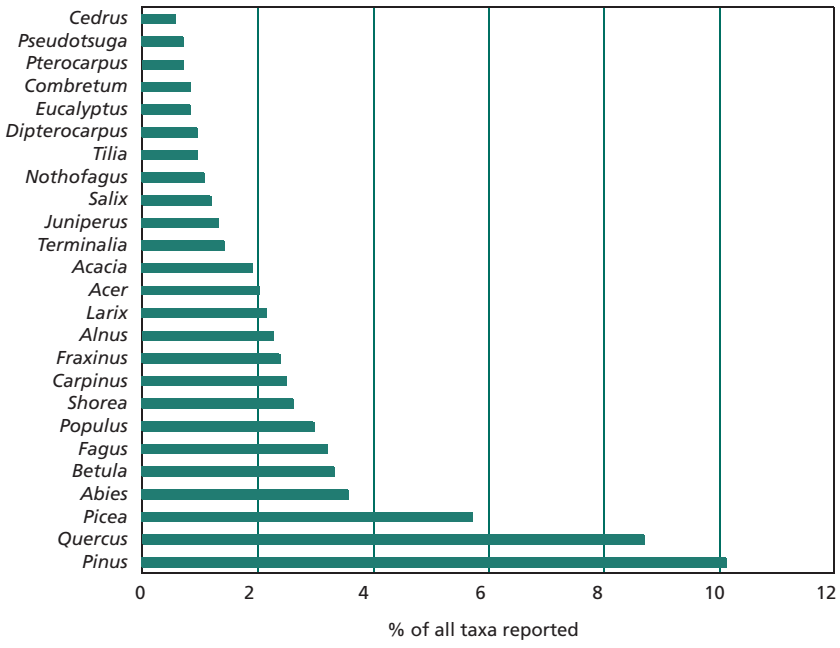


FIGURE 3.9
Twenty-five most common tree genera reported[1]



[1] Among the ten most common species reported by 88 countries.

NUMBER OF NATIVE TREE SPECIES

Estimates of number of species by taxonomic group, by country, are available in the literature, with the notable exception of trees. FRA 2005 is a first attempt to systematically record the number of native forest tree species by country and area at the global level. The definition of a tree is complex; for example there is no universally adopted relative classification of shrubs and trees. The definition of forests used for FRA 2005 includes bamboo, palm and other woody species. In addition, in some cases where a species has been present in a country for many centuries, it is impossible to ascertain whether it is native or was introduced.

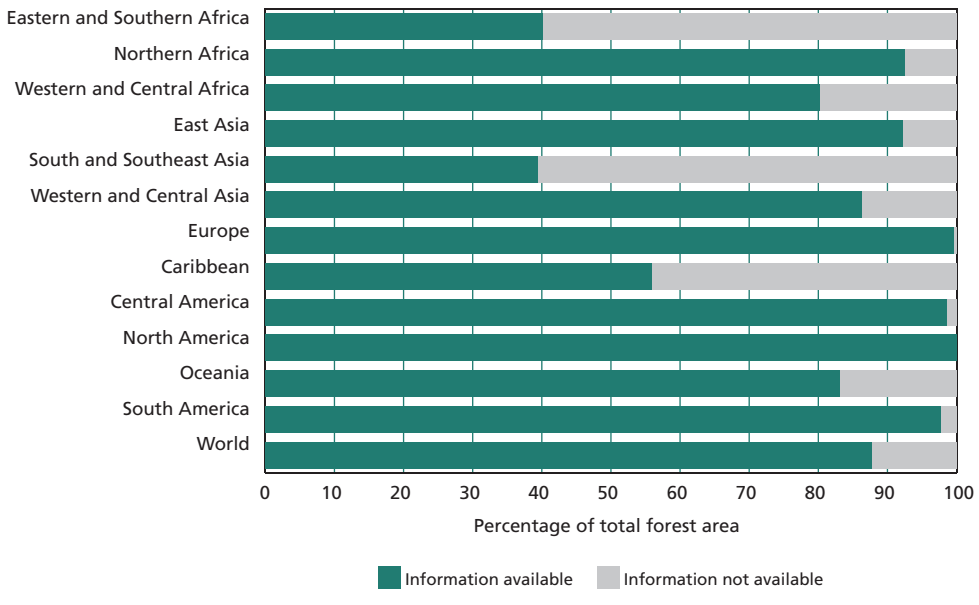
Information availability

Globally, 132 countries and areas accounting for 88 percent of total forest area provided data on the number of native tree species. High response rates were noted in Europe, East Asia, North America, Northern Africa and South America. The lowest response rates were in island states and territories of the Caribbean and Oceania (Figure 3.10).

National data were based on forest inventory lists, flora, national biodiversity reports and discussions with botanists and taxonomists. National forest inventories tend to group species according to their commercial value or to list genera rather than species, making species recording difficult and undervaluing species richness. Some countries reported that a number of native species were under identification or not identified. By default, some areas have reported the total number of plants in the country. A number of countries have undertaken desk studies of available literature and many synonyms were found, making cross-checking difficult.

None of these problems necessarily invalidate the results: identification of tree species present in a country, independently of unsolved taxonomic problems, is notoriously difficult, particularly in mega-diversity areas. The data set was incomplete and its significance in terms of biological diversity will be determined at a later stage. Once these methodological problems are resolved, there is considerable potential for useful information, for instance on the geographical range of species.

FIGURE 3.10
Information availability – number of native forest tree species



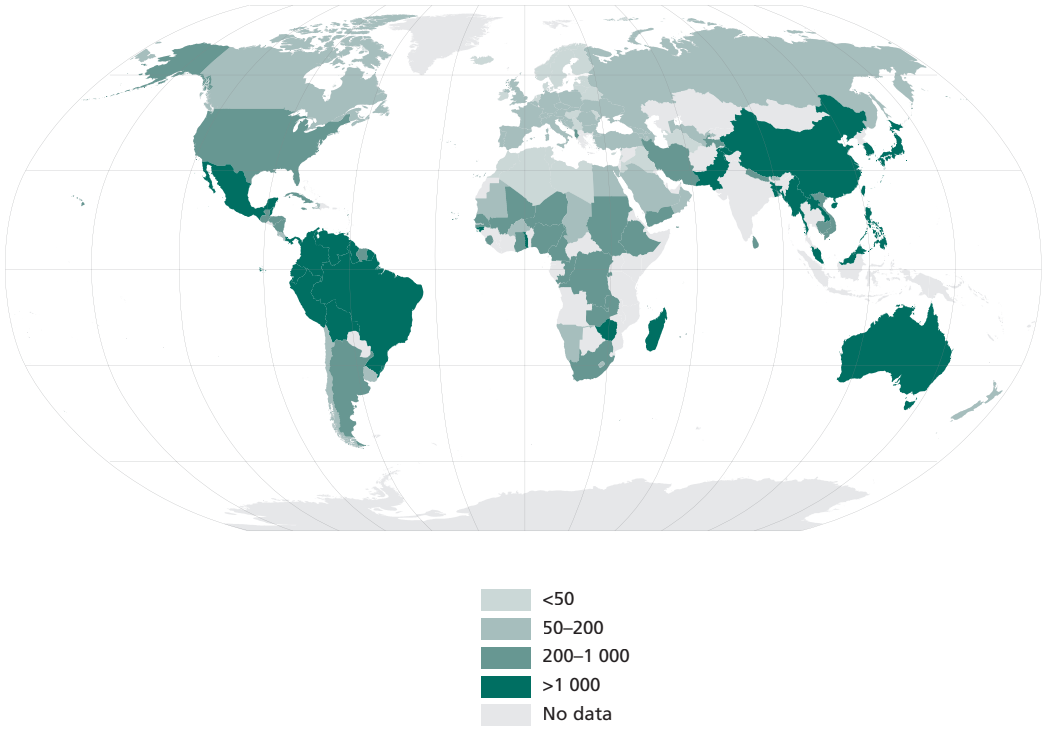
Status

Table 3.8 shows the average number of native tree species for the reporting countries and the range within each region. Individual countries reporting on this topic ranged from a minimum of three native species to a maximum of 7 780. Figure 3.11 illustrates the number of native forest tree species per country.

TABLE 3.8
Native forest tree species

Region/subregion	Information availability			No. of native tree species by country		
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	Aver.	Min.	Max.
Eastern and Southern Africa	10	94 220	40.1	1 076	60	5 000
Northern Africa	12	125 851	92.6	327	12	1 739
Western and Central Africa	11	211 730	74.4	703	140	2 243
Total Africa	**33**	**431 801**	**65.9**	**679**	**12**	**5 000**
East Asia	3	208 177	92.3	1 625	1 049	2 500
South and Southeast Asia	14	117 159	39.4	1 320	105	3 000
Western and Central Asia	16	37 563	86.2	146	20	534
Total Asia	**33**	**362 899**	**64.0**	**778**	**20**	**3 000**
Total Europe	**36**	**993 477**	**99.5**	**63**	**3**	**280**
Caribbean	5	3 194	56.0	409	76	722
Central America	6	23 513	98.6	1 236	117	4 000
North America	4	677 971	100.0	596	21	1 130
Total North and Central America	**15**	**704 678**	**99.6**	**790**	**21**	**4 000**
Total Oceania	**3**	**172 876**	**83.1**	**838**	**121**	**2 100**
Total South America	**12**	**833 428**	**97.7**	**1 994**	**123**	**7 880**
World	**132**	**3 499 159**	**87.7**	**671**	**3**	**7 880**

FIGURE 3.11
Number of native forest tree species



South America has the highest average number of native forest tree species per country. Brazil reported the highest number of forest trees in the world (7 880), with high species diversity in the Amazon basin and in the Atlantic coastal forest (Mata Atlantica). High species richness is also reported by countries in Central Africa, Central America, East Asia, Madagascar and South and Southeast Asia. The lowest average number of trees per country is found in Europe, where Iceland and Malta record the lowest number of native tree species – three – of any country with forests. Species diversity in boreal forests is usually relatively low, and vast expanses of such forests in the northern hemisphere are dominated by a small number of tree species. Countries with dry tropical forests tend to have lower species diversity than countries with moist tropical forests. More generally, it is often mentioned that tree species richness increases with decreasing latitude. Unfortunately, knowledge and documentation of species follow the opposite trend, and many native tropical tree species remain unidentified or unrecorded, especially in Central Africa.

FRA 2000 compiled information for temperate and boreal countries on all forest trees, not only native species. The broad regional trends it identified remain valid (Dudley and Solton, 2003). FRA 2000 found the highest levels of temperate and boreal tree diversity in the western part of the Pacific rim, while the lowest levels occured in the boreal regions. In Europe and Central Asia, tree diversity increased towards the south and east.

The absence of an authoritative world list of trees and shrubs is a serious impediment to assessing and monitoring one of the most basic components of forest biodiversity – tree species richness at the national level. Several ongoing global taxonomic initiatives are expected to ease this limitation in the years to come. At the country level, in addition to taxonomic issues, the development of flora and tree recognition guides will help species identification by foresters and conservationists. Lists of native tree species provide a useful background to lists of endangered tree species, as absolute numbers for the latter are of limited value without some indication of the total number of species.

THREATENED FOREST TREE SPECIES

For FRA 2005, countries were asked to report information on the number of forest tree species considered threatened. Precise status categories were suggested for the terms 'vulnerable', 'endangered' and 'critically endangered', using the ranking system of the *IUCN red list categories and criteria*. For countries and areas with an existing *IUCN red data book* of threatened plants, such information is accessible. The IUCN red list can be sorted by kingdom, genus and species. 'Tree' is not an easily definable group, and at the country level, data had to be gathered on a species by species (or genus by genus) basis. Although IUCN 2000 data are used in FRA 2005, some national reports contain complementary remarks or updates. This is particularly important in the case of discrepancies between IUCN data and national data sources, or when national classification systems are used.

Information availability

Information on vulnerable, endangered and critically endangered forest trees was provided by all regions, representing 192 countries and accounting for 99 percent of total forest area. Information was missing primarily from some of the smaller Pacific and Caribbean islands and some countries in Western and Central Africa (Figure 3.12). Fifty-three countries and areas reported discrepancies with the 2000 red list, while a few countries indicated that a national list of threatened trees was under revision. The availability of data is in line with findings from the UNEP-WCMC desk study for FRA 2000, which indicated that contrary to trees *per se*, for which no global data were available, the availability of global statistics on endangered trees was good.

FIGURE 3.12
Information availability – threatened forest tree species

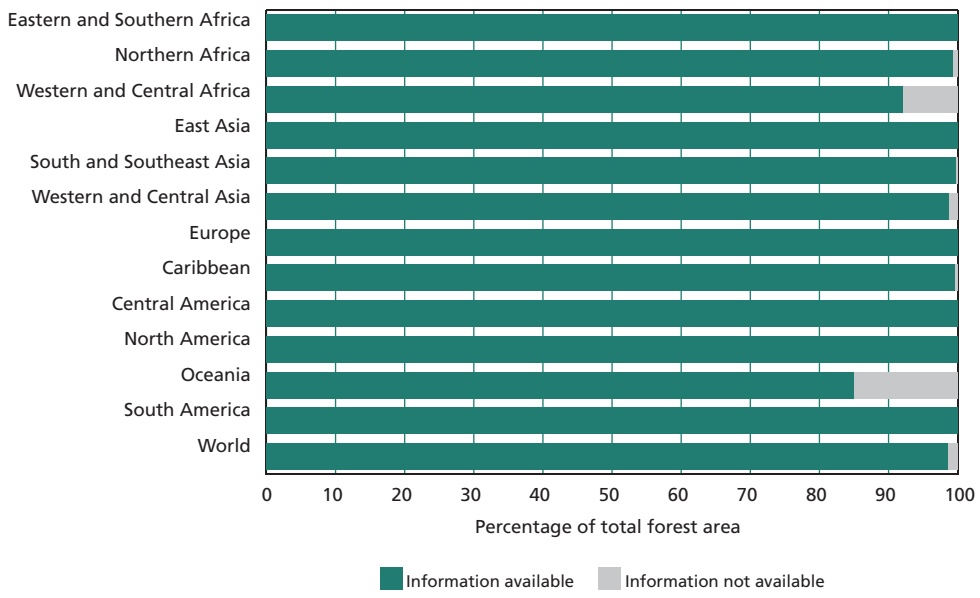


TABLE 3.9
Threatened tree species

Region/subregion	Information availability			No. of critically endangered tree species by country			No. of endangered tree species by country			No. of vulnerable tree species by country		
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	Aver.	Min.	Max.	Aver.	Min.	Max.	Aver.	Min.	Max.
Eastern and Southern Africa	18	235 039	100.0	6	0	41	10	0	65	21	0	63
Northern Africa	15	134 947	99.3	0	0	1	1	0	3	5	0	23
Western and Central Africa	20	262 050	92.1	4	0	50	5	0	27	34	0	138
Total Africa	**53**	**632 036**	**96.4**	**4**	**0**	**50**	**5**	**0**	**65**	**21**	**0**	**138**
East Asia	5	225 663	100.0	20	0	67	18	0	45	37	0	96
South and Southeast Asia	16	296 525	99.7	30	0	122	31	0	99	67	2	403
Western and Central Asia	20	42 995	98.7	0	0	1	0	0	2	1	0	5
Total Asia	**41**	**565 183**	**99.7**	**14**	**0**	**122**	**14**	**0**	**99**	**31**	**0**	**403**
Total Europe	**39**	**998 071**	**100.0**	**0**	**0**	**4**	**0**	**0**	**8**	**1**	**0**	**7**
Caribbean	20	5 683	99.6	4	0	23	7	0	50	10	0	62
Central America	7	23 837	100.0	10	0	43	29	6	71	45	18	106
North America	4	677 971	100.0	14	0	55	19	0	69	21	0	60
Total North and Central America	**31**	**707 491**	**100.0**	**7**	**0**	**55**	**14**	**0**	**71**	**20**	**0**	**106**
Total Oceania	**15**	**176 724**	**84.9**	**3**	**0**	**26**	**2**	**0**	**18**	**8**	**0**	**37**
Total South America	**13**	**852 796**	**100.0**	**9**	**0**	**34**	**17**	**0**	**100**	**48**	**0**	**187**
World	**192**	**3 932 299**	**98.6**	**6**	**0**	**122**	**8**	**0**	**100**	**20**	**0**	**403**

Status

Of the 192 reporting countries (Table 3.9), 146 countries and areas reported that one or more tree species are threatened in their jurisdiction. South America and South and Southeast Asia have the highest number of threatened trees, while the lower rates are found in Europe (Figure 3.13).

The overall high response rate is due to the availability of IUCN red lists. It also shows that there is a clear perception that significant numbers of forest trees are under threat and are found in all regions of the world.

FRA 2005 data on forest cover change, number of native forest trees and number of threatened trees were used to assess the links between loss of forest and number of threatened tree species. No simple relationship was found. Some countries, despite relatively high proportions of remaining natural forests and protected areas, also recorded high levels of risk to individual tree species.

Table 3.10 provides an additional perspective. The number of threatened tree species (the categories 'critically endangered', 'endangered' and 'vulnerable' added together by country) is expressed as a percentage of the total number of native species in individual countries and is then averaged by region and subregion. Representing 87 percent of the global forest area, 126 countries provided data on both native tree species and threatened

FIGURE 3.13
Average number of threatened forest tree species by region

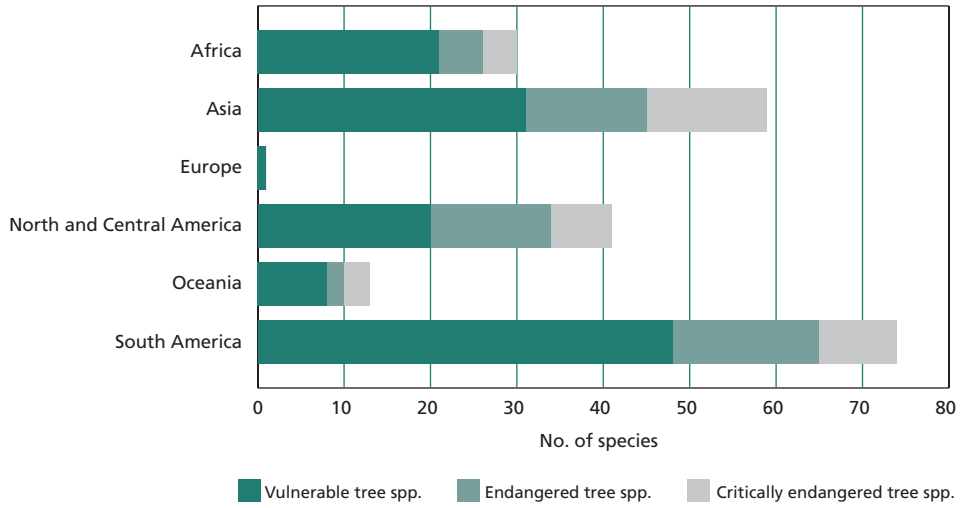


TABLE 3.10
Threatened tree species as percentage of number of native tree species in individual countries

Region/subregion	% of native tree species
Eastern and Southern Africa	11
Northern Africa	3
Western and Central Africa	9
Total Africa	**7**
East Asia	7
South and Southeast Asia	8
Western and Central Asia	1
Total Asia	**4**
Total Europe	**2**
Caribbean	18
Central America	12
North America	5
Total North and Central America	**12**
Total Oceania	**3**
Total South America	**6**
World	**5**

forest species. Globally, approximately 5 percent of the world's native tree species, on average, are reported threatened in their country or territory of origin.

The often-quoted primary direct causes of loss of biodiversity include habitat loss due to land conversion and fragmentation of habitats, alien species invasions and overharvesting of forest resources. The relationship between these factors and biodiversity estimates and surrogates will require further analysis. It is recognized that the value of information on endangered species has some limitations in this regard, owing to the lack of basic data on the distribution and occurrence of most tree species.

Chapter 4

Forest health and vitality

OVERVIEW

Healthy forests are essential for sustainable forest management, yet forests, like other ecosystems, are subject to a number of threats that can cause tree mortality or reduce their ability to provide a full range of goods and services. The causes of the negative impacts on forest health and vitality vary from place to place, and the magnitude and duration of the impacts are not easy to assess. Causes include, but are not limited to, fire, insects and diseases, overexploitation of wood and non-wood forest products, poor harvesting practices, poor management, uncontrolled grazing, invasive species, air pollution and extreme climatic events (e.g. drought, frost, storms and floods). The complexity and interrelationship of these factors and their impact on the health and vitality of forests are difficult to unravel. Indirect impacts may be far reaching and include social, economic and environmental dimensions.

The definition of what constitute disturbance events varies among countries. A number of indicators of forest health and vitality have been developed, e.g. under the auspices of regional and international processes on criteria and indicators for sustainable forest management. Defoliation is one indicator monitored in many boreal and temperate regions. It is influenced by many stress factors and therefore a useful measure of overall forest condition. Monitoring of defoliation is carried out mainly in Europe, Canada and the United States, and to some extent in East Asia. An indicator of forest health that is often suitable in tropical regions is the amount of post-logging woody debris after timber extraction, because excessive amounts of woody debris leave forests in a highly fire-prone state and provide insect breeding sites. However, information on these indicators is not currently available in most countries.

Generally, it may be possible to control or mitigate the extent and impact of damage from pests. However, when the damage is caused by abiotic agents (other than fire), there is little possibility to control the immediate impact, even if there are often opportunities after the fact to limit secondary damage or minimize risk. For example, some countries have made efforts to modify silvicultural practices to reduce the risk of damage by storms.

Continuous monitoring of forest ecosystems is an expensive process, which makes it problematic for developing countries and those with economies in transition. However the results of monitoring can have a considerable impact on public opinion. The monitoring of forest pollution in some European countries, for example, led to implementation of abatement policies and a decrease in the emissions of airborne pollutants (Economic and Social Council (UN) – ECOSOC, 2003). And, conversely, the resulting public support can have a positive effect on the amount of resources and effort put into data collection and monitoring activities.

Factors reported in FRA 2005

Research for FRA 2005 focused on the following factors, which to some extent are quantifiable and for which many countries record incidence and extent:

- forest fires;
- insects and diseases;
- other disturbances (including wind, snow, ice, floods, tropical storms, drought and damage by animals).

Countries were asked to provide data averaged over five years, so that a large fluctuation in a single year did not significantly skew the figures. Data on disturbance

factors are presented for 1990 (an average of the period 1988–1992) and 2000 (average of 1998–2002). No attempt was made to forecast figures for the 2005 reporting period or to obtain data on frequency, intensity and time of disturbance events.

Several disturbance factors were not included in FRA 2005 owing to lack of quantitative information in most countries: illegal logging, encroachment, overharvesting and other unsustainable management practices, pollution and the impact of invasive plant species.

Wildland fires (all vegetation fires), pests and abiotic disturbances interact. Often one disturbance factor predisposes forests and woodlands to exposure to or invasion by other factors. Hence fire, other abiotic factors and biotic factors need to be considered as a whole.

Forest fires. Fire is a major disturbance factor that has both beneficial and detrimental effects. Some forest ecosystems are adapted to fire and depend on it to retain their vigour and reproductive capacity. However fire often gets out of control and destroys forest vegetation and biomass, which in turn results in considerable soil erosion by wind and water. The damage extends to other landscapes and livelihoods as well, and results in haze pollution and deposited pollutants. Forest fires pose a serious threat to peoples' lives and to the sustainable use of natural resources. Both uncontrolled expansion of agricultural land and the increased use of forests for recreational purposes and tourism increase the risk of forest fires.

National and global monitoring must be improved if countries are to manage fires in an ecologically sound way. Data on the extent of forest affected contribute to increasing the understanding of fires, and thus to the development of appropriate risk management strategies. Additional information is needed on the ecological dynamics of fire, direct and underlying causes, impacts and the desired long-term ecosystem condition (e.g. structure, health, species).

Insects and diseases. Pests are defined as any species, strain or biotype of plant, animal or pathogenic agent that injures plants or plant products. Pest outbreaks can contribute directly or indirectly to economic and environmental losses. While insects and diseases are integral components of forests and often fulfil important functions, sporadic outbreaks can have adverse effects on tree growth and survival, yield and quality of wood and non-wood forest products, wildlife habitat and the recreational, scenic and cultural value of forests. The lack of effective quarantine measures, increased international trade in agricultural and forest products, exchange of plant materials and long-range air travel have introduced pathogens and insects into new environments, leading, in some places, to significant forest damage. The International Plant Protection Convention (IPPC), a major international treaty, aims to bring about action to prevent the transboundary spread and introduction of plant and plant-product pests (FAO, 1999b).

Risk analysis, forecasting of future pest outbreaks, and the design and implementation of cost-effective protection strategies all depend on the availability of comprehensive data at various levels. The development of phytosanitary measures to minimize transboundary movement of pests must be based on knowledge of the geographical distribution and biology of a given pest – hence the requirement for national, regional and global-level data.

Other disturbances. Climatic events such as drought, wind, snow, ice and floods have always influenced forest ecosystems. However, global climate change, primarily the result of human activities, is reportedly making forest ecosystems more prone to damage by altering the frequency, intensity and timing of fire events, hurricanes, ice storms, and insect and disease outbreaks. The number of catastrophic climatic events over the past decade seems to go well beyond what could be considered normal meteorological oscillation (ECOSOC, 2003). Climate-related shifts in the range of pest species, many of which are forest-dependent, can further exacerbate abiotic impacts on forest health.

KEY FINDINGS

Globally, information on forest and other wooded land disturbances is relatively sparse, as can be seen in Figure 4.1, and the data-collection basis for disturbances is highly variable. Although information on forest fires is available for 80 percent of the total forest area for the period 1998-2002, it is missing from many African countries. Information on the area of forest significantly affected by insects is available for more than 60 percent of the total forest area, while information on diseases and other disturbances is sporadic. Many of the small island countries and dependent territories have not provided information for this theme.

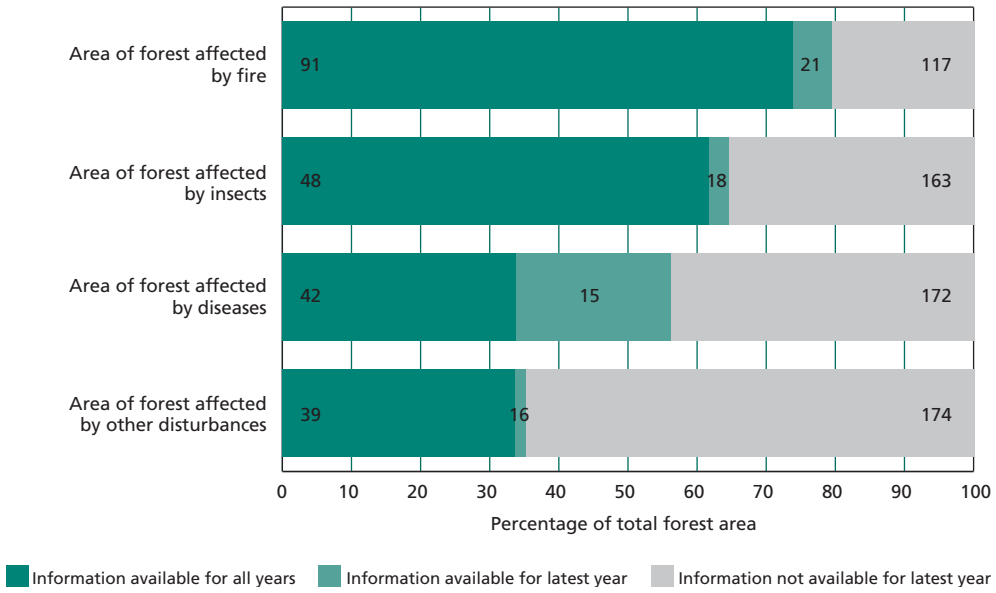
The overall conclusion drawn from the data supplied for FRA 2005 is that the area affected annually for *each* type of disturbance is usually less than 1 percent of the forest area of the reporting countries, although the affected area in individual countries can be much higher.

Total reported area for all disturbance types for 2000 was 104 million hectares or 3.2 percent of the forest area of the reporting countries. However, it should be noted that information was missing from a large number of countries – particularly on area affected by disturbances other than fire – so the actual area is likely to be significantly larger.

The submitted data indicate that, on average, 27.7 million hectares of forests and 5.1 million hectares of other wooded land burned each year of the 2000 reporting period. There was a slight decrease in area for this period when compared with the 1990 period in Africa and North and Central America, but an increase in all other regions. However, it should be noted that FRA 2005 presents a compilation of data reported by the countries and that information was missing from a large number of these. Thus the findings should be treated with caution.

There are other methodologies for identifying burned areas (for example satellite monitoring) that do not necessarily differentiate between forests and other vegetation types (Global Burnt Area 2000 Project (GBA-2000), 2000), and which indicate that a much larger area is burned annually than that indicated in FRA 2005.

FIGURE 4.1
Information availability – forest health and vitality



Note: Figures present number of countries in each category.

Reports received by FAO indicate that the extent of forest adversely affected by insects and diseases in the 2000 reporting period was 68 million hectares per year – more than twice the extent reported for fire – despite the fact that fewer countries reported on these disturbances than on fire. However, owing to recurring events and the longer duration of disturbance events caused by insects and diseases compared with those caused by fire or storms, it is difficult to assess the annually affected area accurately.

The area of forest adversely affected by insects was reported as being lower for 2000 than for 1990 – primarily owing to a substantial decrease in affected areas reported by Canada and the United States. Most other subregions and regions reported an increase in insect-affected forest area.

The total area of forest affected by disease was slightly higher in the 2000 period than in 1990 for those countries providing information on both periods. However, information was only available for one-third of the total forest area and was missing from most countries in Africa, Central and North America and Oceania.

Reporting of other abiotic and biotic disturbances was sporadic at best, with East Asia and Europe being the only ones with reports covering more than half their forest areas. The area of other disturbances almost doubled between the two reporting periods in Europe, primarily owing to the effects of severe storms such as those of December 1999.

Some single, large, sudden impact climatic events – such as extreme wind (particularly on islands), floods, snow or ice – were reported to have greater impact than fire.

It should be kept in mind that impacts from abiotic disturbances are recorded more easily than those caused by diseases and insects. The latter have a much longer duration and thus require greater resources for monitoring and recording. FRA 2005 shows that the impacts of fire, insects, diseases and other disturbances on forests can be severe in some countries, but that, in general, less than 5 percent of the world's forests are affected by such disturbances in a given year. However, the assessment also clearly highlights the lack of data.

Efforts to gather, analyse and widely disseminate reliable country-based information on forest health factors must be further strengthened in order to provide a solid basis for decision-making and enhanced field-level action. This information can provide the foundation for reliable risk analyses and the implementation of effective forest protection measures. To be successful, these must in turn ensure wide stakeholder involvement and continue to pursue both preventive and remedial action.

FOREST FIRES

Fire has been a major factor in the development and management of many of the world's forests. Some forest ecosystems have evolved in response to frequent fires from natural as well as human causes, but others are negatively affected. Every year, millions of hectares of the world's forests are consumed by fire, with loss of human and animal life and very substantial economic damage in destroyed wood and non-wood forest resources, loss of biodiversity, release of carbon to the atmosphere, burned housing, degraded real estate, high costs of fire suppression, and damage to other environmental, recreational and amenity values (Davidenko and Eritsov, 2003; FAO, 2005e; Kudoh, 2005; United Nations Economic Commission for Europe (UNECE) and FAO, 2001; UNECE *et al.*, 2000).

Most fires in forests and woodlands today are caused by humans. They are the result of a misuse of fire for conversion of forests to agricultural lands, maintenance of grazing lands, extraction of non-wood forest products, hunting, and clearing of land for mining, industrial development and resettlement. Forest fires may also be the result of personal or ownership conflicts.

Identification of the extent, causes and impacts of forest fires is a specialized technical area. The fire data in FRA 2005 indicate the overall extent, but in most cases provide minimal details of the underlying causes and impacts. Further information on fire disturbances is contained in a separate thematic report to be released during 2006 (Box 4.1).

BOX 4.1

FRA 2005 thematic study on forest fires

The study complements FRA 2005 through greater depth of data and information on the incidence, impact and management of forest fires and related issues in different regions around the globe. Data and information are being prepared by wildland fire specialists from each of the 12 regional wildland fire networks, which are supported by FAO, the United Nations International Strategy for Disaster Reduction (ISDR) and the Global Fire Monitoring Center (GFMC). FAO is publishing the regional reports early in 2006 as separate working papers under the Forest Fire Management Working Paper series. An in-depth analysis of these regional reports is being compiled as the global thematic study, to be published during 2006.

The study assesses the fire situation in each region, including the extent of forest area affected, number and types of fires and the causes. In recognition that not all fires are destructive, given that some ecosystems need fire-induced regeneration, both positive and negative social, economic and environmental impacts are outlined. An integrated approach to wildland fire management addresses: prediction, preparedness and prevention as key elements in the reduction of the negative impacts of fire; rapid response in extinguishing fires; and restoration after the fact. These elements constitute the rationale for voluntary guidelines for wildland fire management, which are currently being drafted.

The thematic study also addresses key issues in the institutional aspects of wildland fire management, including the roles and responsibilities of diverse stakeholders and their capacities and capabilities for prevention and suppression – particularly the role of community-based fire management. Based on these issues, a global strategy is being prepared for enhancing collaboration at international, regional, national and subnational levels in order to implement the voluntary guidelines.

Selected findings of the thematic report include:

- Some 80 to 90 percent of wildland fires are caused by human activities, primarily through the uncontrolled use of fire for: clearing forest and woodland for agriculture, maintaining grasslands for livestock management, extraction of NWFPs, industrial development, resettlement, hunting and arson. Thus proactive fire management must involve all these stakeholders.
- Legislation and expensive equipment alone are insufficient to prevent and suppress wildland fires. Given that their livelihoods are at stake, local communities and populations need to be actively involved in fire prevention and suppression.
- It is not only the biological and physiological effects of fire that must be understood in fire management strategies, but also the underlying socio-economic and cultural reasons for the use of fire, including poverty, food security and livelihood issues.
- Data on both destructive and beneficial fires are needed, including their overall economic and ecological impacts.
- To prevent and respond to fire emergencies, greater collaboration and agreement are increasingly required at international, regional, national and subnational levels.

Further information is available at: www.fao.org/forestry/site/fire-alerts/.

Although fire is one of the primary agents of forest degradation, as a natural process it serves an important function in maintaining the health of certain ecosystems. The conventional view of fire as a destructive agent requiring immediate suppression has given way to the view that fire can and should be used to meet land management goals and certain ecological conditions.

The impact of fires will vary significantly depending not only on the intensity and extent of the fire, but also on whether the ecosystem is fire sensitive, fire dependent/influenced or fire independent. Fire-dependent ecosystems are those that have evolved in the presence of fire; fire-sensitive ecosystems are those that have not evolved in its presence and thus its occurrence in these ecosystems has a negative impact; and fire-independent ecosystems are those that lack sufficient fuel to ignite fires, such as deserts and Antarctic tundra. According to The Nature Conservancy (2004), of the global area of major habitat types in important conservation ecoregions, 46 percent is fire dependent/influenced, 36 percent is fire sensitive and 18 percent fire independent.

To grasp the full impact and the roles of fire in forest ecosystems, an understanding is needed not only of the biological and physiological impacts, but also of the social sciences and the underlying socio-economic and cultural reasons for the use of fire. Thus the fields of sociology, community relations, public administration and food security should be involved when preparing fire management strategies.

However, technical and social fire management solutions are not enough. Legal and regulatory solutions in fire-dependent ecosystems and fire-prone forests need to be included as well.

Globally, the majority of forest fires stem from agricultural burning for land management – mostly adjacent to or outside the forest itself – that gets out of control (GBA-2000, 2000). Consequently, proactive fire management would include collaboration with the agricultural sector.

It is important that countries collect data on beneficial as well as detrimental fires. For an assessment of the overall economic impact of detrimental fires, both the direct economic damage and the ecological damage must be calculated.

A common understanding is needed regarding the basis for data collection on forest fires and the value that can be gained from data collection for management strategies. Other issues include the criteria for collecting and assessing national, regional and global wildland fire data and for streamlining the definitions used in forest fire management.

Additional research is needed on the ecological dynamics of forest fires and their underlying causes. Categorization of fire types should be undertaken, as well, so that the data collected can be used more effectively in fire management. Farmers, ecologists and forest staff need to be trained in the differences between beneficial and detrimental fires. This includes knowledge of how to use the right kind of fire in fire-adapted ecosystems and how to extinguish harmful fires in fire-sensitive ones.

Information availability

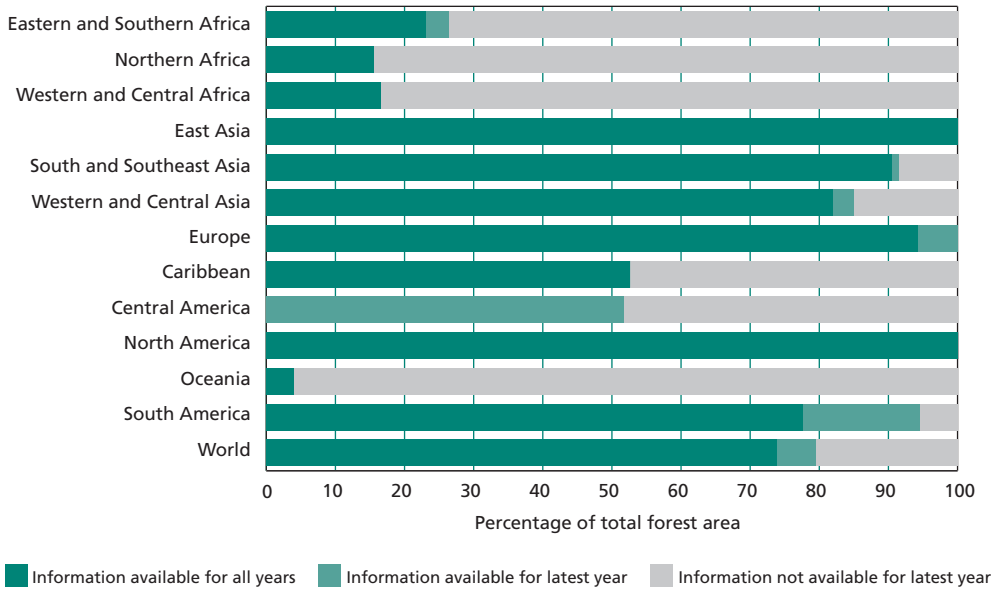
Classification of fires that occur in forests and other wooded land is complex. There is presently no global classification that distinguishes between beneficial and detrimental fires, and consequently no detailed global information on fire types in forests and other wooded land.

Of the 229 countries and areas included in FRA 2005, 91 provided data on the average annual area of forest adversely affected by fires for both the 1990 and 2000 reporting periods, while an additional 21 countries provided data for the 2000 reporting period only – for a total of 112 countries accounting for 80 percent of the total forest area. For the 2000 reporting period, eight regions or subregions provided data on more than 50 percent of their forested area, Oceania provided data on less than 5 percent of its forested area and information from Africa was largely missing (Figure 4.2).

Data were reported on 73, 65 and 35 percent of other wooded land in South America, Northern Africa and Western and Central Asia respectively, but on 25 percent or less of other wooded land in all other regions.

As a result of the different methodologies of data collection, data are not usually directly comparable among regions and countries except on a broad scale. Some countries do not separate forests and other wooded land when recording data, while others do so.

FIGURE 4.2
Information availability – forest fires



Research data are sparse on altered fire regimes and on historical and natural fire frequency and burning intensity. There is a relatively greater amount of data available on intensively managed semi-natural forests and forest plantations because of the higher investment in monitoring and control of fire. These intensively managed systems tend to be fire sensitive. As a result, the data provided for FRA 2005 primarily reflect fire impact in fire-sensitive ecosystems. In natural, fire-dependent forests, such as savannah forests, woodlands and boreal forests, it is more difficult to assess the true impact of fire.

Information is lacking for a number of countries in which forest fires are known to have occurred, including countries in Africa, Central Asia and Oceania. This is partly the result of a lack of capacity to collect and analyse data at the national level.

To improve the monitoring and assessment of fire damage to forests and other wooded land, it would be useful to have data-collection systems that are directly comparable. Thus there is a need to harmonize definitions and share information on methods of data collection and analysis.

Status

In the 2000 reporting period, the average area burned annually was at least 27.7 million hectares of forests, equivalent to 0.9 percent of the forest area of the reporting countries. An additional 5.1 million hectares of other wooded land were also reported as significantly affected by fire. The highest percentages were reported from Africa and Asia, while Europe reported the lowest. Two countries (Myanmar and Chad) reported that more than 6 million hectares of forests were affected by fires annually. Information on fire types, intensity and impact was not provided. Table 4.1 presents a regional/subregional summary.

The percentage of forest area affected by fires in Northern Africa is primarily due to high figures from Chad, where an estimated 50 percent of the Sudanian zone and 20 percent of the Sahelian zone are affected each year – down from 70 and 30 percent respectively in the 1990 reporting period.

The low figure for the total area of forest affected by fires in Oceania is the result of only two countries reporting (American Samoa and New Zealand). In South America, Brazil reported incomplete data.

TABLE 4.1
Average area of forest annually affected by fire 1998–2002

Region/subregion	Information availability			Area of forest affected by fire	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	8	62 129	26.4	483	0.8
Northern Africa	5	21 076	15.5	6 176	29.3
Western and Central Africa	7	47 558	16.7	519	1.1
Total Africa	**20**	**130 763**	**19.9**	**7 177**	**5.5**
East Asia	5	225 663	100.0	523	0.2
South and Southeast Asia	12	272 087	91.5	11 029	4.1
Western and Central Asia	16	36 994	85.0	218	0.6
Total Asia	**33**	**534 744**	**94.4**	**11 770**	**2.2**
Total Europe	**37**	**997 658**	**100.0**	**1 597**	**0.2**
Caribbean	3	3 004	52.6	13	0.4
Central America	4	12 338	51.8	130	1.1
North America	3	677 968	100.0	4 333	0.6
Total North and Central America	**10**	**693 310**	**98.0**	**4 476**	**0.6**
Total Oceania	**2**	**8 244**	**4.0**	**n.s.**	**n.s.**
Total South America	**10**	**806 483**	**94.6**	**2 719**	**0.3**
World	**112**	**3 171 203**	**79.5**	**27 740**	**0.9**

TABLE 4.2
Trends in area of forest annually affected by fire 1988–1992 and 1998–2002

Region/subregion	Information availability (both periods)			Average area of forest affected by fire *(1 000 ha)*		Annual change rate *(%)*
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	
Eastern and Southern Africa	7	54 096	23.0	76	45	-5.2
Northern Africa	5	21 076	15.5	9 191	6 176	-3.9
Western and Central Africa	6	47 214	16.6	477	514	0.8
Total Africa	**18**	**122 386**	**18.7**	**9 745**	**6 735**	**-3.6**
East Asia	5	225 663	100.0	319	523	5.1
South and Southeast Asia	11	268 946	90.4	10 095	11 020	0.9
Western and Central Asia	13	35 700	82.0	57	198	13.2
Total Asia	**29**	**530 309**	**93.6**	**10 471**	**11 742**	**1.2**
Total Europe	**31**	**941 240**	**94.3**	**1 043**	**1 584**	**4.3**
Caribbean	3	3 004	52.6	6	13	8.0
Central America	0					
North America	3	677 968	100.0	4 402	4 333	-0.2
Total North and Central America	**6**	**680 972**	**96.2**	**4 408**	**4 346**	**-0.1**
Total Oceania	**1**	**8 226**	**4.0**	**n.s.**	**n.s.**	**3.1**
Total South America	**6**	**662 062**	**77.6**	**139**	**154**	**1.0**
World	**91**	**2 945 145**	**73.8**	**25 806**	**24 561**	**-0.5**

Note: As some countries did not report a complete series, figures for 2000 are slightly different from those presented in the preceding table.

Trends

Data on forest fires are available for the 1990 and 2000 reporting periods. Table 4.2 presents a summary of this information.

The annual average area of forest fires was reported to have increased in 35 countries, decreased in 31 countries and remained almost constant in 25. From the data provided, it is difficult to discern any global trends. Africa reported a decrease in the 2000 period compared with the 1990 period, but this was due to the decrease in Chad referred to above and was based on data for less than 20 percent of the total forest area in the

subregion, with information missing from most of the sub-Saharan countries. All other regions reported a slight increase.

INSECTS AND DISEASES

Outbreaks of insects and diseases in forests have resulted in substantial economic losses and environmental damage, even though they may be less visible and less dramatic than fires and ice storms. For the purposes of this report insects and diseases are analysed together, as they are often co-dependent.

Insects and diseases are integral components of forest ecosystems and normally are present at a relatively low density, causing little damage and having negligible impact on tree growth and vigour. From time to time, however, some species may quickly reach damaging numbers, spatial distribution may increase and the outbreak may persist for a variable time before subsiding. Such large populations may have adverse effects on many aspects of forests, such as tree growth, survival, yield and quality of wood and non-wood forest products, and soil and water conservation. Such outbreaks are costly to control and may cause considerable damage, compromise national economies, local livelihoods and food security, and result in trade restrictions on forest products.

The types of problems caused by introduced insects and diseases have changed rapidly in recent years. Movement of insects and diseases has been facilitated by intensified long-range air travel and reduced travel time, increased international trade of agricultural and forest products and the exchange of plant material. Local climatic fluctuations may facilitate the establishment of introduced insects in previously hostile environments. Introduced forest pests can be extremely destructive, as seen in recent years in the impact of the cypress aphid (*Cinara cupressivora*) in Eastern and Southern Africa and more recently in South America.

As mentioned, the International Plant Protection Convention (IPPC) is a major international treaty that aims to secure action to prevent the transboundary spread and introduction of plant and plant-product pests (FAO, 1999b). The International Standards for Phytosanitary Measures (ISPM) (FAO, 1995–2005), developed within the framework of the IPPC, include a basic framework for risk analysis and development of phytosanitary measures to minimize such transboundary movement. Particularly relevant to forestry are ISPM No. 15, *Guidelines for regulating wood packaging material in international trade* (FAO, 2002b), and the ISPMs relating to risk analysis and pest reporting and status. Data on the movement of and disturbances by introduced insects are essential in the development of risk management strategies for transboundary pests.

Despite the significant adverse impacts of forest insects and diseases, and indications that outbreaks are on the increase in some regions, insects and diseases are often not considered in the planning of forest and forest-conservation programmes. There has been no attempt to systematically gather and analyse comprehensive information on the type, scale and impact of such outbreaks at the global level.

Identification of insects and diseases as causal agents of damage to forests is a highly specialized technical area. The insect and disease data in FRA 2005 indicate the overall extent of forest affected, but offer minimal details in most cases on the underlying causes.

A system that enables data to be reported on a continuous as well as an ad hoc basis could encompass the complexity of information required – so as to have data useful to the development of risk management strategies for forests and other wooded land.

Insect and disease problems are often either cyclical or chronic. Thus they require long-term investment in data collection and technical resources in order to fully assess the complexity and extent of the issues. A chronic disturbance by insects and diseases may be caused by a complex of species rather than by a single entity. The complex can vary not only in the species involved but also in the impact of each individual

species within that particular disturbance. Thus defining the beginning and end of a disturbance event can be a challenge.

There are further complications in recording data: (i) some insect life cycles overlap or are significantly longer than one year (e.g. the Siberian caterpillar – *Dendrolimus sibiricus*); and (ii) other cyclical disturbance events caused by insects last more than a year. For example, gypsy moth (*Lymantria dispar*) outbreaks of several generations can be every 7–10 years. More recently, however, the period between outbreaks has apparently been becoming shorter. Capturing data for such long-term cyclical events is difficult, particularly when there is variability in the length of cycles. The information supplied by countries for insect disturbances has been reported for annual averages over five years. With long cyclical outbreaks, five-year reporting periods do not adequately reflect the status of these events.

Moreover, due to the longer duration of some disturbance events, it is difficult to accurately assess the area affected annually. Some countries appear to have reported the cumulative area affected in a given year, rather than the additional area of forest affected within that year. Thus the figures for the different types of disturbances are not directly comparable.

Information availability

The status of the data on insect and disease disturbances is poor, mainly owing to a lack of clarity in interpreting what constitutes a 'disturbance'. Globally, the quantifiable data on insect incidences and their effects on forests and forest products are limited. Insect and disease outbreaks in developing countries are primarily surveyed and reported for forest plantations and planted trees only, and corresponding surveys of forest decline and dieback are rare in these countries. Serious outbreak situations may be recorded, but details of causative agents and the quantifiable impact on forest resources often are not. In some instances, there may be a reluctance to record such severe outbreaks because management jobs or even forest products trade can be put at risk.

Data on insects and diseases are collected and reported in a variety of ways. In some instances, data provided on the area of forest affected by diseases and insects (and other biotic disturbances) are not separated.

For insect infestations, of the 229 countries included in FRA 2005, 48 countries provided data for both the 1990 and 2000 reporting periods; a further 18 countries provided data for the 2000 reporting period only. These 66 countries represent 65 percent of the world's forest area. Reports from East Asia, Europe and North America covered more than 90 percent of their forest areas, while those from Africa and Oceania covered less than 1 percent of the forest area in their respective regions (Figure 4.3).

For diseases, 42 countries provided data for both the 1990 and 2000 reporting periods. A further 15 countries provided data for the 2000 reporting period only.

For the 2000 reporting period, East Asia and Europe provided data for over 80 percent of the forest areas within the region, while North America, South America and South and Southeast Asia each provided information for more than 50 percent of the forest area in their respective region or subregion. Data from Africa, the Caribbean and Oceania were largely missing (Figure 4.4).

For some regions, more data exist but were not readily accessible for this report owing to a lack of information exchange among sectors, individuals and government agencies or a lack of awareness of the existence of data.

To complement existing information and facilitate documentation on forest health at the country level, FAO is compiling data, with the cooperation of experts from member countries, for a global information system on the impact of insect and disease outbreaks on natural and planted forests, other wooded land and trees outside forests. The system is intended for national forest services, research and academic institutions and technical

FIGURE 4.3
Information availability – forest insect pests

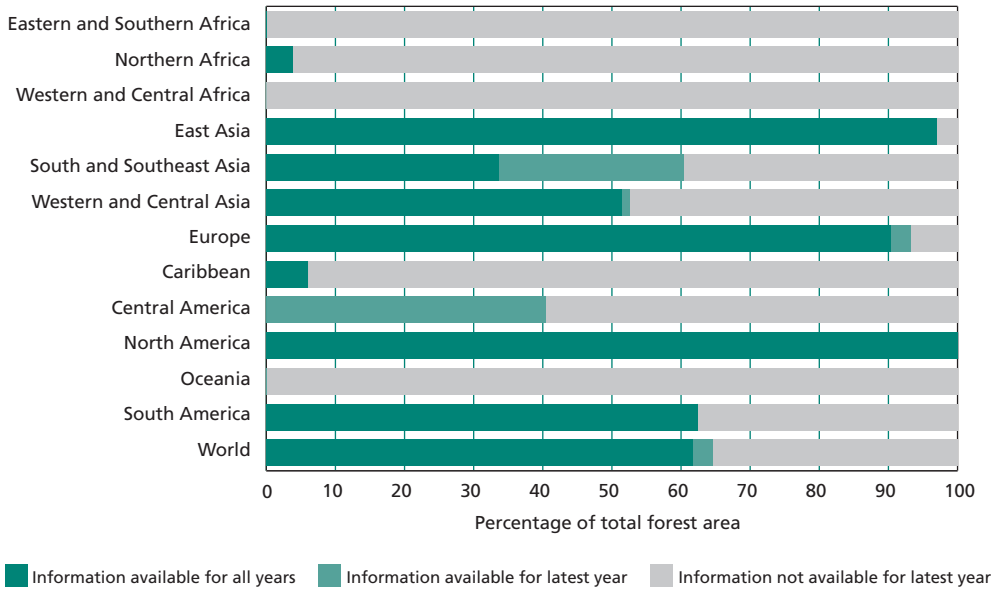
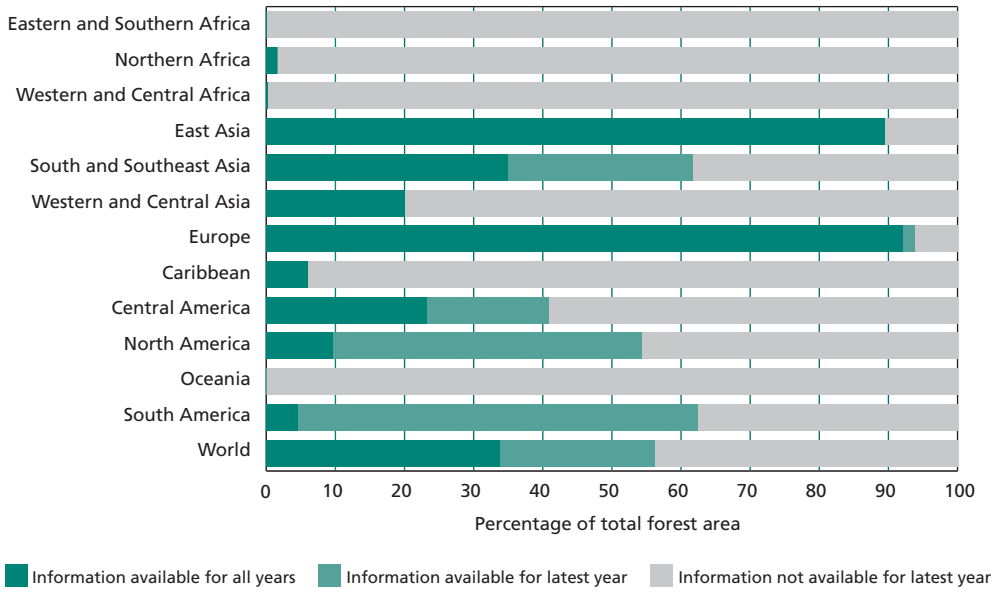


FIGURE 4.4
Information availability – diseases



officers dealing with forestry and pest management. It should help improve planning and decision-making, increase awareness of the severe problems related to forest insects and diseases worldwide, and provide up-to-date baseline information to support risk assessment and the design and implementation of effective forest protection strategies (www.fao.org/forestry/site/18748/en). A two-tiered questionnaire has been sent to in-country technical specialists in an attempt to obtain more detailed information. The results of this study are available in a separate thematic report (Box 4.2).

BOX 4.2

FRA 2005 thematic study on forest pests

Figures are rarely available on losses attributed directly to infestations of forests, trees and forest products by insects and diseases, particularly in developing countries and countries in transition. Thus, in addition to seeking quantitative information for FRA 2005, FAO compiles qualitative profiles of individual pest problems by country. Information is collated from many sources, through expert contacts in the countries, via the Internet and in literature searches. The study is ongoing and constantly updated.

Data are indexed, making it possible to highlight information on pest distribution that could indicate potential invasiveness between neighbouring countries. Information on the host preference of individual causative agents can be extracted, as well as breakdowns of pests at the country level.

The impact of pests on the forest sector is often underestimated, as illustrated in the following examples:

- Since an infestation of *Dendroctonus ponderosae* (mountain pine beetle) was first detected in interior British Columbia in 1994, an estimated 240 million m³ of timber on 11.3 million hectares have been lost, at an estimated cost of US$1.7 million per year. The beetle is spreading fast across Canada and threatens to move south into United States forests. Huge investments in control are now necessary, with more than US$82 million recently committed by the Canadian Government (Wilent, 2005).
- In eastern and southern Africa, three accidentally introduced aphids were the first specific conifer pests to invade the region, and they became the most damaging pests of these species. Since their initial introduction, the pine wooly aphid, *Pineus boerneri*, the pine needle aphid, *Eulachnus rileyi*, and the cypress aphid, *Cinara cupressivora*, have proliferated throughout southern and eastern Africa and continue to spread. It was conservatively estimated that, by 1990, *C. cupressivora* had killed trees worth approximately US$44 million and was causing a loss in annual growth increment of a further US$14.6 million per year. In addition, the two pine aphids were causing a further loss of approximately US$2.4 million per year to annual growth increment in pine forest plantations in the region. This economic data was instrumental in securing resources to mount a biological control programme, which led to substantial reductions of incidence of at least the cypress aphid (Murphy, 1996).
- In New Zealand it is estimated that the forest industry spends US$0.60/ha on the monitoring of diseases and pests, in comparison with US$3.50/ha on fire defence. Yet average annual losses to disease amount to some US$137 million, whereas losses to fire are just US$682 000 (Hocking, 2003).

At this time, 19 profiles have been completed from four regions. As more countries are included, there will be more opportunities for comparison. This information should not only increase awareness of the importance of forest health, but also encourage countries to collect data that will enhance the accuracy of future global forest resources assessments.

Status

Globally, the combined forest area adversely affected by insects and diseases for the 2000 reporting period was approximately 68 million hectares. In most cases, there are no details indicating the causative agent(s), so the data provided may reflect combined insect and disease disturbances. The highest area of insect disturbance reported for a single country was 14.2 million hectares (Canada), and of disease disturbance, 17.4 million

TABLE 4.3
Average area of forest annually affected by insects 1998–2002

Region/subregion	Information availability			Area of forest affected by insects	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	2	48	n.s.	0	0
Northern Africa	3	5 346	3.9	83	1.5
Western and Central Africa	0				
Total Africa	**5**	**5 394**	**0.8**	**83**	**1.5**
East Asia	4	218 842	97.0	9 329	4.3
South and Southeast Asia	7	179 498	60.4	1 010	0.6
Western and Central Asia	11	22 841	52.5	464	2.0
Total Asia	**22**	**421 181**	**74.3**	**10 803**	**2.6**
Total Europe	**28**	**930 556**	**93.2**	**6 354**	**0.7**
Caribbean	1	341	6.0	0	0
Central America	2	9 638	40.4	2	n.s.
North America	3	677 968	100.0	19 332	2.9
Total North and Central America	**6**	**687 947**	**97.2**	**19 334**	**2.8**
Total Oceania	**1**	**18**	**n.s.**	**n.s.**	**0.1**
Total South America	**4**	**531 886**	**62.4**	**561**	**0.1**
World	**66**	**2 576 982**	**64.6**	**37 134**	**1.4**

TABLE 4.4
Average area of forest annually affected by diseases 1998–2002

Region/subregion	Information availability			Area of forest affected by diseases	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	2	48	n.s.	0	0
Northern Africa	2	2 203	1.6	130	5.9
Western and Central Africa	1	461	0.2	100	21.6
Total Africa	**5**	**2 712**	**0.4**	**229**	**8.5**
East Asia	2	201 877	89.5	883	0.4
South and Southeast Asia	8	183 398	61.7	8 471	4.6
Western and Central Asia	8	8 701	20.0	31	0.4
Total Asia	**18**	**393 976**	**69.5**	**9 386**	**2.4**
Total Europe	**24**	**936 300**	**93.8**	**3 135**	**0.3**
Caribbean	1	341	6.0	0	0
Central America	2	9 747	40.9	33	0.3
North America	2	367 834	54.3	17 382	4.7
Total North and Central America	**5**	**377 922**	**53.4**	**17 415**	**4.6**
Total Oceania	**1**	**18**	**n.s.**	**0**	**0**
Total South America	**4**	**531 886**	**62.4**	**830**	**0.2**
World	**57**	**2 242 814**	**56.2**	**30 995**	**1.4**

hectares (United States) – both countries within the top five in terms of forest area and with good data-collection systems. Tables 4.3 and 4.4 present a summary of results for the 2000 reporting period.

Trends

The data reflect differences in the two periods, but as only two reporting periods are compared, they should not be construed as trends. The raw data indicate a very large increase in the level of disease reported and a decrease in the level of insect damage reported between the 1990 and 2000 reporting periods. However, this is primarily because more countries reported for the 2000 period than for 1990.

Analysing data only for those countries that have provided information for two points in time, the area affected by diseases shows a slight increase globally (from 4.4 to 4.7 million hectares per year), despite a significant decrease reported by Africa and East Asia (Table 4.5). The increase in South America is particularly noticeable and is primarily due to the fact that Chile has reported a very large increase in the area of forest affected by diseases.

TABLE 4.5
Trends in area of forest annually affected by diseases 1988–1992 and 1998–2002

Region/subregion	Information availability (both periods)			Average area of forest affected by diseases *(1 000 ha)*		Annual change rate *(%)*
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	
Eastern and Southern Africa	2	48	n.s.	0	0	0
Northern Africa	1	2 144	1.6	241	130	-6.0
Western and Central Africa	1	461	0.2	179	100	-5.7
Total Africa	**4**	**2 653**	**0.4**	**420**	**229**	**-5.9**
East Asia	2	201 877	89.5	1 821	883	-7.0
South and Southeast Asia	4	103 870	34.9	51	70	3.2
Western and Central Asia	8	8 701	20.0	47	31	-3.8
Total Asia	**14**	**314 449**	**55.5**	**1 919**	**985**	**-6.5**
Total Europe	**18**	**919 309**	**92.1**	**2 059**	**2 631**	**2.5**
Caribbean	1	341	6.0	0	0	0
Central America	1	5 539	23.2	3	33	26.2
North America	1	65 540	9.7	11	2	-15.7
Total North and Central America	**3**	**71 420**	**10.1**	**14**	**35**	**9.4**
Total Oceania	**0**					
Total South America	**3**	**38 673**	**4.5**	**13**	**810**	**51.6**
World	**42**	**1 346 503**	**33.8**	**4 426**	**4 690**	**0.6**

Note: As some countries did not report a complete series, figures for 2000 are slightly different from those presented in Table 4.4.

TABLE 4.6
Trends in area of forest annually affected by insects 1988–1992 and 1998–2002

Region/subregion	Information availability (both periods)			Average area of forest affected by insects *(1 000 ha)*		Annual change rate *(%)*
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	
Eastern and Southern Africa	2	48	n.s.	0	0	0
Northern Africa	2	5 287	3.9	61	82	3.0
Western and Central Africa	0					
Total Africa	**4**	**5 335**	**0.8**	**61**	**82**	**3.0**
East Asia	4	218 842	97.0	8 306	9 329	1.2
South and Southeast Asia	3	99 970	33.6	8	10	2.6
Western and Central Asia	9	22 372	51.4	235	413	5.8
Total Asia	**16**	**341 185**	**60.2**	**8 549**	**9 752**	**1.3**
Total Europe	**20**	**901 989**	**90.4**	**2 536**	**5 945**	**8.9**
Caribbean	1	341	6.0	0	0	0
Central America	0					
North America	3	677 968	100.0	33 658	19 332	-5.4
Total North and Central America	**4**	**678 309**	**95.9**	**33 658**	**19 332**	**-5.4**
Total Oceania	**0**					
Total South America	**4**	**531 886**	**62.4**	**916**	**561**	**-4.8**
World	**48**	**2 458 703**	**61.6**	**45 721**	**35 672**	**-2.5**

Note: As some countries did not report a complete series, figures for 2000 are slightly different from those presented in Table 4.3.

The area affected by insects, on the other hand, shows a decrease (from 45.7 to 35.7 million hectares per year), owing to a substantial decrease in affected areas reported by Canada and the United States. Most other subregions and regions reported an increase in the area of forest affected by insects (Table 4.6). In Europe, the large increase in the area of forest affected by insects in the 1998–2002 period compared with the 1988–1992 period may be due to increased attacks following the storms of December 1999. This may also be the reason behind the increase in the area affected by diseases in this region.

It should be noted that this information is indicative as, again, there are only the two data points in time and data are missing for a large number of countries. Conclusions cannot be drawn from the data as to the causative agents or trees species involved and the effects on trees and the forest ecosystem as a whole.

OTHER DISTURBANCES

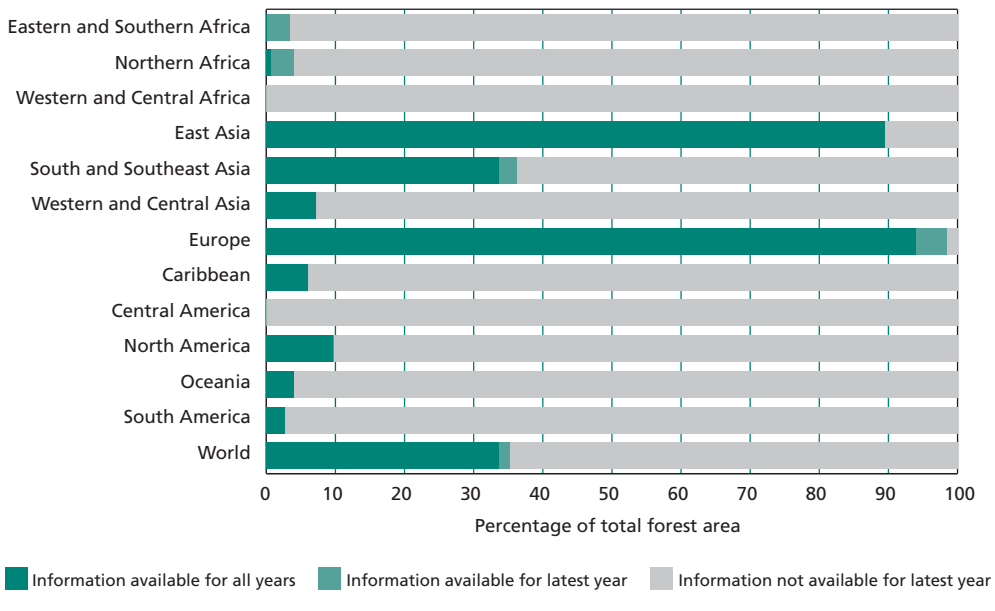
In the context of the FRA 2005 report, other disturbances include abiotic factors (e.g. wind, snow, ice, floods, tropical storms and drought) and damaging biotic agents other than insects and diseases (e.g. camels, beavers, deer and rodents). In general, information on disturbances attributed to these other biotic and abiotic factors is highly erratic, with a broad range of causative agents. Thus few of the data are comparable.

In Europe, a comprehensive overview of forest damage events is provided by the European Forest Institute's Database on Forest Disturbances in Europe. The effects on European forests of the severe storms of December 1999 and the floods of 2002 are well documented.

Information availability

Of the 229 countries involved in FRA 2005, 39 countries provided data on other disturbances for both the 1990 and 2000 reporting periods (33 percent of the total forest area). A further 16 countries provided data for the 2000 reporting period only. The reports were mainly from Europe and East Asia (Figure 4.5).

FIGURE 4.5
Information availability – other disturbances



Data for other wooded land were too limited to permit further analysis (less than 15 percent of the area of other wooded land in all regions).

Status

Total reported annual average area affected for the 2000 reporting period was 8.4 million hectares (Table 4.7). The highest area of other disturbances reported for a single country was 3.9 million hectares (Finland). However, this figure is the cumulative area affected rather than the average area newly affected in a given year. Overall, the data reflect a range of types of disturbances. First, there were single, major catastrophic events such as hurricanes, which cause widespread destruction and loss of trees, and which may weaken trees and make them susceptible to secondary infestations. Second, there were longer term, chronic pressures, such as consistent feeding by animals, that either cause significant, direct damage to trees or have indirect effects such as increased soil compaction beneath the trees, which may contribute to dieback and decline. Thus, collectively, without being broken down, the data are not particularly useful in the development of management strategies. However, detailed breakdowns into specific types of disturbances are given in most of the country reports for use at the national level.

Trends

Comparative data for the 1990 and 2000 reporting periods were provided by approximately 50 percent of the countries in the European region, together accounting for 94 percent of the total forest area in the region. The East Asia subregion provided comparative data on other disturbances for 89 percent of the forest area, and South and Southeast Asia for 34 percent. All other regions or subregions provided information for less than 10 percent of their combined forest area. Table 4.8 presents a regional summary.

The area of other disturbances almost doubled between the two reporting periods in Europe, primarily due to the effects of severe storms such as those in December 1999.

Wind, snow, drought and ice damage events have been reported, with wind being a significant factor in Europe and the tropical areas and islands for the 2000 reporting period. However, it should be noted that very little detail has been provided on other disturbances.

TABLE 4.7
Average area of forest annually affected by other disturbances 1998–2002

Region/subregion	Information availability			Area of forest affected by other disturbances	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	3	8 079	3.4	4	n.s.
Northern Africa	2	5 287	3.9	3	n.s.
Western and Central Africa	0				
Total Africa	**5**	**13 366**	**2.0**	**6**	**n.s.**
East Asia	2	201 877	89.5	847	0.4
South and Southeast Asia	4	107 885	36.3	3	n.s.
Western and Central Asia	3	3 121	7.2	4	0.1
Total Asia	**9**	**312 883**	**55.2**	**853**	**0.3**
Total Europe	**33**	**981 715**	**98.4**	**7 544**	**0.8**
Caribbean	1	341	6.0	0	0
Central America	0				
North America	2	65 543	9.7	3	n.s.
Total North and Central America	**3**	**65 884**	**9.3**	**3**	**n.s.**
Total Oceania	**3**	**8 270**	**4.0**	**11**	**0.1**
Total South America	**2**	**22 839**	**2.7**	**0**	**0**
World	**55**	**1 404 957**	**35.2**	**8 418**	**0.6**

TABLE 4.8
Trends in area of forest annually affected by other disturbances 1988–1992 and 1998–2002

Region/subregion	Information availability (both periods)			Average area of forest affected by other disturbances *(1 000 ha)*		Annual change rate *(%)*
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	
Eastern and Southern Africa	1	8	n.s.	0	0	0
Northern Africa	1	959	0.7	n.s.	n.s.	-9.9
Western and Central Africa	0					
Total Africa	**2**	**967**	**0.1**	**n.s.**	**n.s.**	**-9.9**
East Asia	2	201 877	89.5	790	847	0.7
South and Southeast Asia	3	99 936	33.6	n.s.	n.s.	-2.5
Western and Central Asia	3	3 121	7.2	3	4	1.2
Total Asia	**8**	**304 934**	**53.8**	**793**	**851**	**0.7**
Total Europe	**24**	**937 939**	**94.0**	**4 124**	**7 330**	**5.9**
Caribbean	1	341	6.0	1	0	-100.0
Central America	0					
North America	1	65 540	9.7	1	1	0
Total North and Central America	**2**	**65 881**	**9.3**	**2**	**1**	**-7.7**
Total Oceania	**1**	**8 226**	**4.0**	**5**	**7**	**3.4**
Total South America	**2**	**22 839**	**2.7**	**0**	**0**	**0**
World	**39**	**1 340 786**	**33.6**	**4 924**	**8 188**	**5.2**

Information on the impacts of these types of disturbances is important. At this point in time, there is insufficient quantitative information for a proper trend analysis. Some data have relevance to relatively isolated areas (specific animal species), whereas other types have much broader relevance (storms, wind). Countries have varying perceptions about what constitute 'other disturbances'.

Subdivision of the data would help provide more meaningful comparisons and conclusions at regional and global levels. Where feasible, consideration should be given to both direct and indirect effects (e.g. compaction of soils). A framework needs to be developed within which to capture information, prioritize types of disturbances and define data-collection methodologies from a global perspective.

Chapter 5

Productive functions of forest resources

OVERVIEW

Forests and trees outside forests provide a wide range of wood and non-wood forest products. The productive function of forest resources is a common thematic element of all the ecoregional criteria and indicator processes. This reflects an ambition to maintain an ample, valuable supply of primary forest products, while at the same time ensuring that production and harvesting are sustainable and do not compromise the management options of future generations.

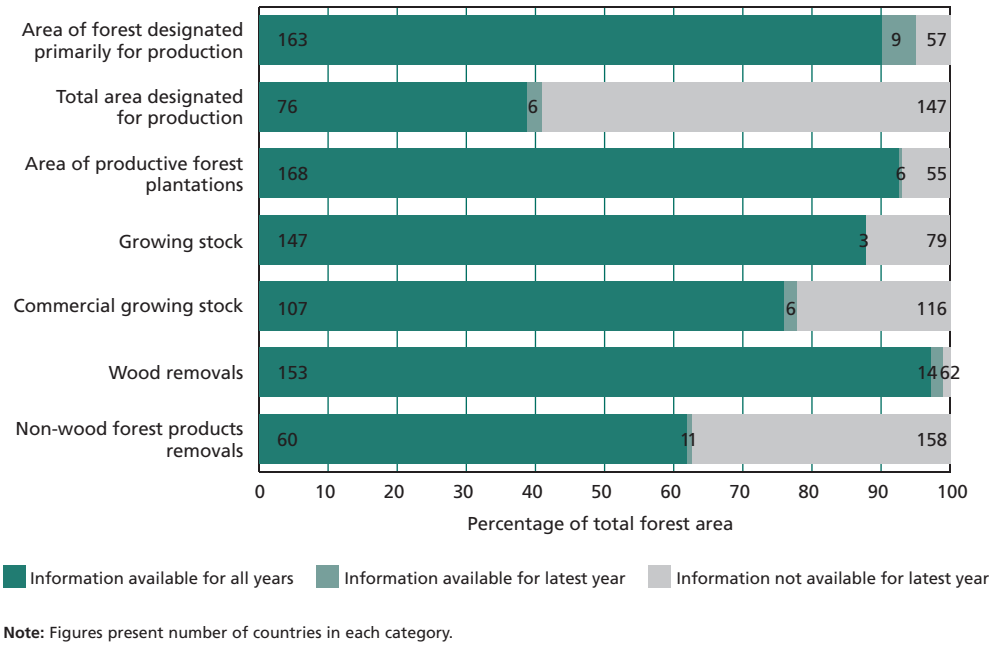
Describing the forest resource as a provider of goods has traditionally been one of the main objectives of global forest resources assessments. Earlier assessments focused on timber supply, but the concept of forest production has since widened to encompass all types of wood and non-wood forest products.

As part of the FRA 2005 reporting process, information was collected on the following variables related to the productive function of forest resources:

- area of forest designated for production;
- area of productive forest plantations;
- growing stock and commercial growing stock;
- removals of wood products;
- removals of non-wood forest products (NWFPs).

Data availability and reliability are problems with some of these variables, for example removals of non-wood forest products, as can be seen in Figure 5.1.

FIGURE 5.1
Information availability – productive functions of forest resources



Note: Figures present number of countries in each category.

KEY FINDINGS

Many products are extracted from forests, ranging from wood for timber and fuelwood to food (berries, mushrooms, edible plants, bushmeat), fodder and other NWFPs. By quantity, wood destined for industrial use is the most important product; among NWFPs, food and fodder are the most significant.

About half the world's forests are designated for production (as either primary or secondary function) and thus are available to supply wood and non-wood forest products. The total area of forest designated for production does not show any significant trend for the period 1990–2005.

Productive forest plantations represented 1.9 percent of global forest area in 1990, 2.4 percent in 2000 and 2.8 percent in 2005. Currently, there are about 109 million hectares of productive forest plantations in the world. The Asia region accounts for 41 percent; Europe 20 ; North and Central America 16; South America and Africa 10 percent each and Oceania 3 percent. The top ten countries account for 73 percent of the total area, with China, the Russian Federation and the United States together accounting for more than half the total area of productive forest plantations.

The area of productive forest plantations increased by 2.0 million hectares per year during 1990–2000 and by 2.5 million hectares per year during 2000–2005. All regions show an increase in plantation area, and the highest plantation rates are found in Asia, particularly in China.

It should be noted that these figures refer only to productive forest plantations[1] and do not include the planted component of semi-natural forests designated for productive purposes. Nor do they include plantations established for the protection of soil and water or other environmental purposes.

In 2005 the total global growing stock of forests is estimated at 434 billion m^3, which corresponds to an average of 110 m^3 per hectare. The countries with the most growing stock per hectare are found in central Europe and some tropical areas.

Total growing stock shows a slight downward tendency – mainly owing to the decrease in forest area. However, some regions also show significant trends in growing stock per hectare, for example Europe shows an increase and Southeast Asia a decrease.

About 202 billion m^3 or 47 percent of the total growing stock is considered commercial. Higher percentages in relation to total volume are found in countries with temperate forests and lower ones in those with tropical forests.

Global wood removals in 2005 amount to 2.8 billion m^3. About 40 percent is fuelwood (1.2 billion m^3), but the proportions vary among regions, with Africa reporting 88 percent of removals as fuelwood, while North and Central America reported only 13 percent.

There are no significant global trends in wood removal. Africa reported increased removals while Asia showed a significant decrease. Europe, North and Central America and South America reported only a slight decrease.

Countries usually do not report illegal removals and informal fuelwood gathering, so figures for removals might be much higher. The reported figures on fuelwood removals are particularly weak, as a large part of fuelwood gathering is informal.

Annual wood removals account for about 0.7 percent of total global growing stock and 1.5 percent of commercial growing stock. These figures are indicative, and the figures on removals should not be directly compared with figures on growing stock, particularly at the country level. Removals take place partially outside forests, e.g. in

[1] In FRA 2005, 'productive forest plantation' is defined as a "forest of introduced species and in some cases native species, established through planting or seeding mainly for production of wood or non-wood goods". Man-made forests of native species are classified as plantations when they are characterized by few species, straight tree lines and even-aged stands, otherwise they are classified as semi-natural forests.

other wooded land and from trees outside forests – particularly fuelwood removals in developing countries – while growing stock estimates refer only to forest area.

There is insufficient information available on NWFPs in most countries, both developing and developed, and they are usually not included in national accounts and trade statistics. Consequently, the figures reported to FRA 2005 are in many cases incomplete, resulting in underestimates of NWFP removals, making it difficult to draw any far-reaching conclusions. However, the figures reported for the period 1990–2005 show a generally increasing trend.

In conclusion, the productive functions of forest resources are of great importance and have not undergone drastic changes during the 15-year period covered by FRA 2005, with the exception of the area of productive plantation forests, which shows a steady increase in all regions and a particularly rapid increase in Asia. Of the remaining variables, some show increasing and others decreasing trends. There are regional variations, but in most cases no clear regional patterns. A few notable regional trends can be seen, however, such as the increase of growing stock per hectare in Europe and its decrease in Southeast Asia. Further, taking under-reporting into account, it can be concluded that substantial amounts of NWFPs are removed annually and that these products play an important role at both local and national levels.

FOREST AREA DESIGNATED FOR PRODUCTIVE PURPOSES

This indicates to what extent forest areas have been set aside for production, either by legal prescription or by decision of the landowner or manager.

Forest designation is reported in two ways: 'primary function' and 'total area with function'. Forest areas with a specific, designated function considered to be significantly more important than other functions are reported as 'primary function'. All areas with a designated function (not necesssarily primary) are reported as 'total area with function'.

Information availability

Of the 229 countries and areas covered by FRA 2005, 172 provided information on forests designated primarily for productive purposes. For 2005, 141 of these reported having areas where production is designated as the primary function, and only 82 countries reported on total area with function. The countries reporting data on areas designated primarily for production account for 94 percent of the global forest area. In a few subregions, however, reporting countries account for a lower proportion of total forest area, i.e. the Caribbean, Central America and Western and Central Africa (Figure 5.2).

The countries that reported data on total area with function account for only 41 percent of the global forest area (Figure 5.3). Asia, North America and South America show higher then average reporting coverage, while Africa, the Caribbean, Europe (due to the absence of reporting by the Russian Federation) and Oceania show coverage below 15 percent.

The remaining countries/areas either did not report or reported that no information was available. These countries may still have areas designated for production, but they are either included in other categories, such as 'multiple use', or cannot be quantified.

Status

Table 5.1 shows a summary by region/subregion of the 2005 status of areas designated primarily for productive purposes.

At the global level, 34 percent of total forest area has production designated as its main purpose. In Europe, some 73 percent of forest area has production as the primary function, while North America reported only 6 percent designated for production – instead reporting most of its forests as designated for multiple use. This indicates a clear regional difference in the perception of forest designation.

FIGURE 5.2
Information availability – area of forest designated primarily for production

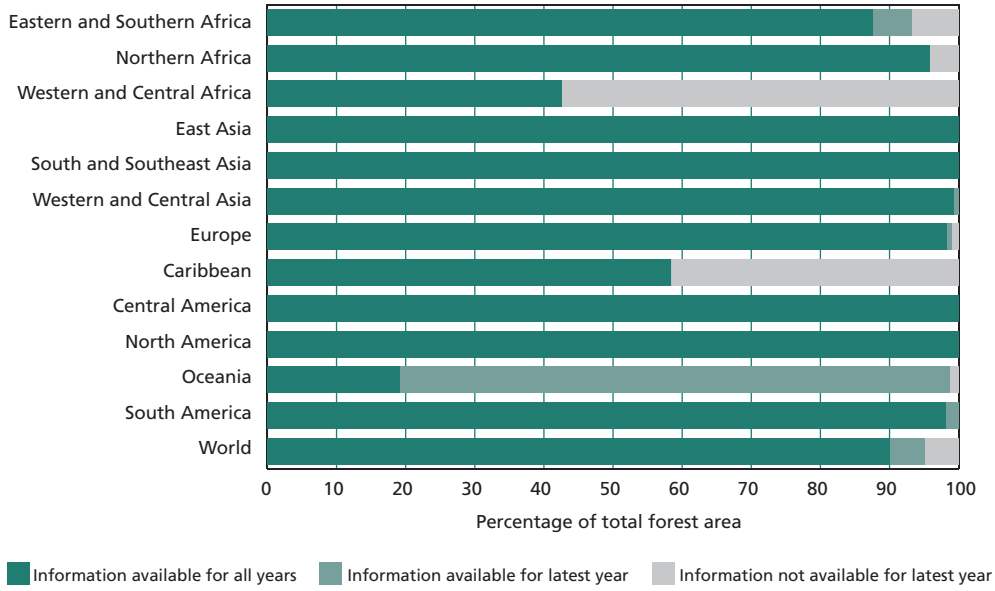
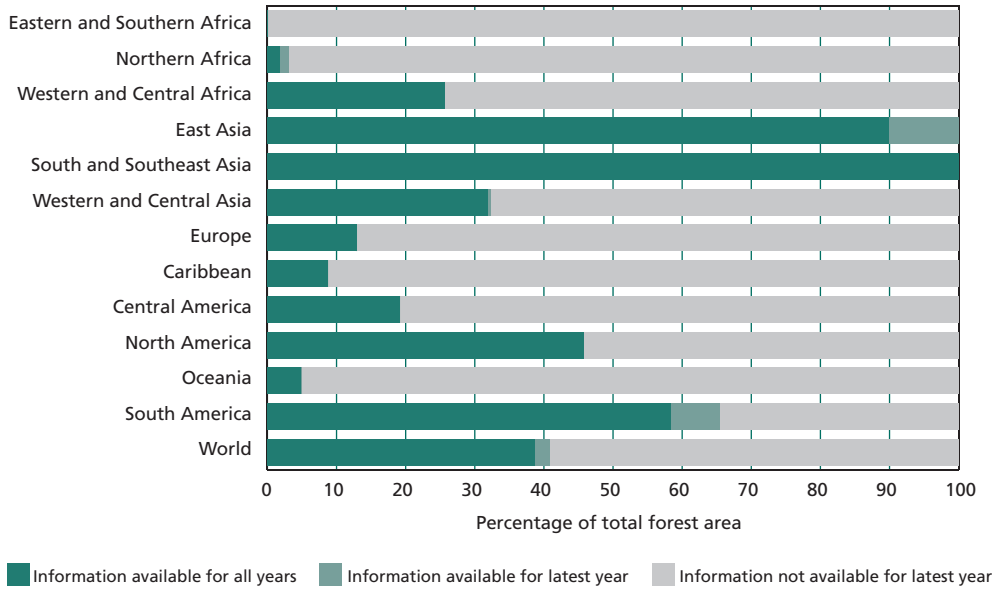


FIGURE 5.3
Information availability – total area of forest designated for production



Data on total area with function are too weak to allow a breakdown by region and subregion. Globally, 54 percent of forest area was reported as designated for productive purposes, whether as the primary or secondary function. This figure can be seen as a global estimate of the area of forest available for the supply of wood and non-wood forest products.

TABLE 5.1
Area of forest designated primarily for production 2005

Region/subregion	Information availability			Area of forest designated primarily for production	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	16	211 181	93.2	41 051	19
Northern Africa	13	125 667	95.9	44 185	35
Western and Central Africa	15	118 280	42.6	52 796	45
Total Africa	**44**	**455 129**	**71.6**	**138 032**	**30**
East Asia	5	244 862	100.0	125 488	51
South and Southeast Asia	17	283 126	100.0	120 098	42
Western and Central Asia	23	43 579	100.0	9 674	22
Total Asia	**45**	**571 567**	**100.0**	**255 260**	**45**
Total Europe	**36**	**991 192**	**99.0**	**724 308**	**73**
Caribbean	9	3 489	58.4	980	28
Central America	7	22 411	100.0	3 312	15
North America	4	677 464	100.0	40 499	6
Total North and Central America	**20**	**703 364**	**99.6**	**44 790**	**6**
Total Oceania	**14**	**203 467**	**98.6**	**22 449**	**11**
Total South America	**13**	**831 540**	**100.0**	**96 346**	**12**
World	**172**	**3 756 260**	**95.0**	**1 281 185**	**34**

TABLE 5.2
Trends in area of forest designated primarily for production 1990–2005

Region/subregion	Information availability (all 3 years)			Area of forest designated primarily for production *(1 000 ha)*			Annual change rate *(%)*	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	2005	1990–2000	2000–2005
Eastern and Southern Africa	15	198 343	87.6	39 712	38 156	37 677	-0.40	-0.25
Northern Africa	13	125 667	95.9	48 670	46 016	44 185	-0.56	-0.81
Western and Central Africa	15	118 280	42.6	59 947	55 741	52 796	-0.72	-1.08
Total Africa	**43**	**442 291**	**69.6**	**148 329**	**139 913**	**134 658**	**-0.58**	**-0.76**
East Asia	5	244 862	100.0	126 821	119 688	125 488	-0.58	0.95
South and Southeast Asia	17	283 126	100.0	130 350	132 285	120 098	0.15	-1.91
Western and Central Asia	21	43 272	99.3	9 566	9 591	9 541	0.03	-0.10
Total Asia	**43**	**571 259**	**99.9**	**266 737**	**261 564**	**255 127**	**-0.20**	**-0.50**
Total Europe	**34**	**984 468**	**98.3**	**770 508**	**722 051**	**721 355**	**-0.65**	**0.02**
Caribbean	9	3 489	58.4	849	828	980	-0.25	3.41
Central America	7	22 411	100.0	6 325	4 202	3 312	-4.01	-4.65
North America	4	677 464	100.0	37 934	40 458	40 499	0.65	0.02
Total North and Central America	**20**	**703 364**	**99.6**	**45 108**	**45 488**	**44 790**	**0.08**	**-0.31**
Total Oceania	**11**	**39 593**	**19.2**	**5 651**	**9 371**	**9 261**	**5.19**	**-0.24**
Total South America	**12**	**816 436**	**98.2**	**88 216**	**103 224**	**91 073**	**1.58**	**-2.47**
World	**163**	**3 557 412**	**90.0**	**1 324 549**	**1 281 612**	**1 256 266**	**-0.33**	**-0.40**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in the preceding table.

Trends

The analysis of trends in area of forest designated primarily for production is based on the countries that reported a complete time series (163 countries representing 90 percent of the global forest area). The results are shown in Table 5.2.

Globally, there is a slight decreasing tendency for area of forest with production as the primary function. Many regions/subregions follow the global trend, while others (e.g. Asia and South America) show an irregular pattern. In the case of Asia, Myanmar adopted a new classification in 2000, adding some 20 million hectares as primarily designated for

production. For South America, most countries are either stable or reporting a steady increase. Peru, however, reported a decrease of about 15 million hectares since 2000.

PRODUCTIVE FOREST PLANTATIONS

Forest plantations – a subset of all planted forests – are defined as forests of introduced species and in some cases native species, established through planting or seeding, with few species, even spacing and/or even-aged stands. Productive forest plantations are defined as forest plantations predominantly intended for the provision of wood, fibre and non-wood forest products.

Productive plantations can also provide protective, recreational, amenity and other functions, which are not precluded by the harvesting of products.

Some forests classified as semi-natural include planted trees of native species, most of which are used for productive purposes. As these forests do not fall under the forest plantation definition, they are not included in this analysis. The FRA 2005 thematic study on planted forests provides a more detailed analysis of both forest plantations and the planted forest component of semi-natural forests (see Chapter 2, Box 2.1).

Information availability

Information on the area of productive forest plantations forms part of country reporting on forest characteristics. Out of 229 countries, 174 provided information for 2005 and 168 information for all three reporting years: 1990, 2000 and 2005. The countries providing information account for 93 percent of the global forest area (Figure 5.4). Unfortunately, information is missing from many of the smaller islands and areas and from many of the countries in the Congo Basin.

Some countries experienced difficulty in differentiating between predominantly productive or protective functions, because their forest plantations are managed for multiple purposes.

Status

The total area of productive forest plantations reported in 2005 was about 109 million hectares, which corresponds to 2.8 percent of the global forest area. The area by region and subregion is presented in Table 5.3.

FIGURE 5.4
Information availability – area of productive forest plantations

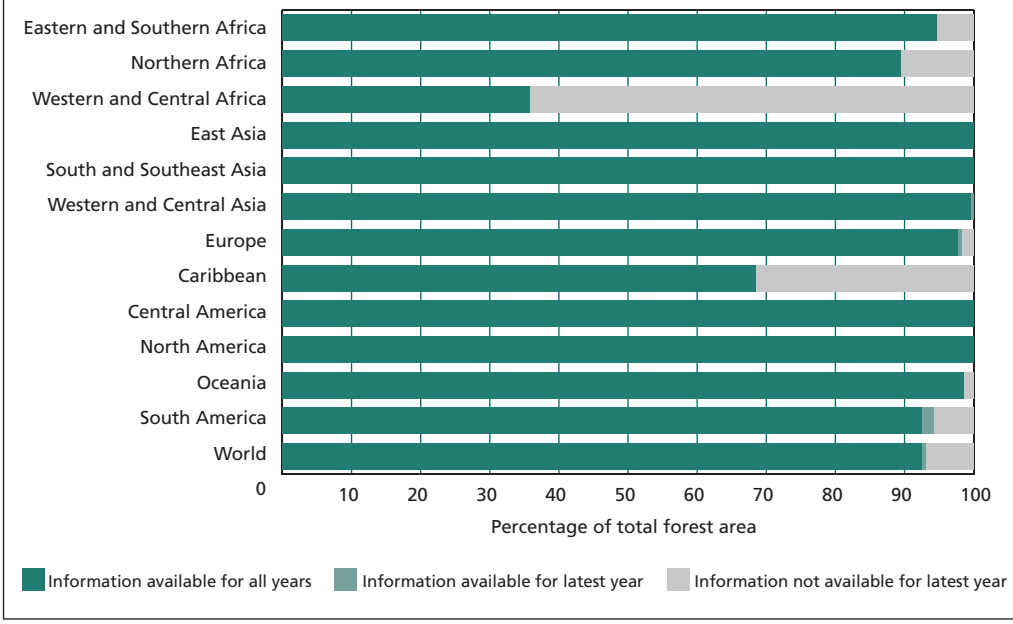


TABLE 5.3
Area of productive forest plantations 2005

Region/subregion	Information availability			Area of productive forest plantations	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	18	214 589	94.7	2 792	1.3
Northern Africa	12	117 193	89.4	6 033	5.1
Western and Central Africa	17	99 566	35.8	1 939	1.9
Total Africa	**47**	**431 347**	**67.9**	**10 764**	**2.5**
East Asia	5	244 862	100.0	30 006	12.3
South and Southeast Asia	17	283 126	100.0	11 825	4.2
Western and Central Asia	23	43 579	100.0	2 591	5.9
Total Asia	**45**	**571 567**	**100.0**	**44 422**	**7.8**
Total Europe	**36**	**983 907**	**98.3**	**21 469**	**2.2**
Caribbean	12	4 090	68.5	280	6.9
Central America	7	22 411	100.0	240	1.1
North America	4	677 464	100.0	17 133	2.5
Total North and Central America	**23**	**703 965**	**99.7**	**17 653**	**2.5**
Total Oceania	**11**	**203 455**	**98.6**	**3 833**	**1.9**
Total South America	**12**	**783 827**	**94.3**	**11 326**	**1.4**
World	**174**	**3 678 069**	**93.1**	**109 469**	**3.0**

Subregions reporting the greatest area of productive forest plantations are East Asia, Europe and North America, together accounting for about 63 percent of global productive forest plantations. In East Asia most of the plantations are found in China, and in North America in the United States.

Subregions reporting the least area of productive forest plantations are the African subregions, the Caribbean, Central America and Western and Central Asia.

In many subregions, the majority of the productive forest plantations are found in just a few countries. In the East Asia subregion, 95 percent of the productive forest plantations are found in China. In South and Southeast Asia, 68 percent are in India, Indonesia, Malaysia and Thailand. In Western and Central Asia, 98 percent are found in the Islamic Republic of Iran and in Turkey. Canada, which acknowledges that it has forest plantations, had insufficient data for area reporting. Thus in North America, 99.6 percent of the reported forest plantations are in the United States. In Eastern and Southern Africa, 51 percent are in South Africa; in Western and Central Africa, 71 percent are in Côte d'Ivoire, Nigeria, Rwanda and Senegal; and in Northern Africa, 96 percent are in Ethiopia, Morocco and the Sudan. The Russian Federation has 55 percent of the productive forest plantations in Europe; Australia and New Zealand 93 percent of those in Oceania; and Argentina, Brazil and Chile 82 percent of those in South America.

The ten countries with the greatest area of productive forest plantations account for 79.5 million hectares or 73 percent of the total global area of productive forest plantations (Figure 5.5). China, the United States and the Russian Federation together account for more than half the world's productive plantations.

Trends

Trends were reported for the 168 countries providing information for all three reporting years. The main results of this analysis are presented in Table 5.4.

At the global level, the area of productive forest plantations increased by 2.0 million hectares per year during 1990–2000, and by 2.5 million hectares per year during 2000–2005, an increase of 23 percent compared with the 1990–2000 period. In relative terms, productive forest plantations accounted for 1.9 percent of total global forest area in 1990, 2.4 percent in 2000 and 2.8 percent in 2005.

FIGURE 5.5
Ten countries with largest area of productive forest plantations 2005
(%)

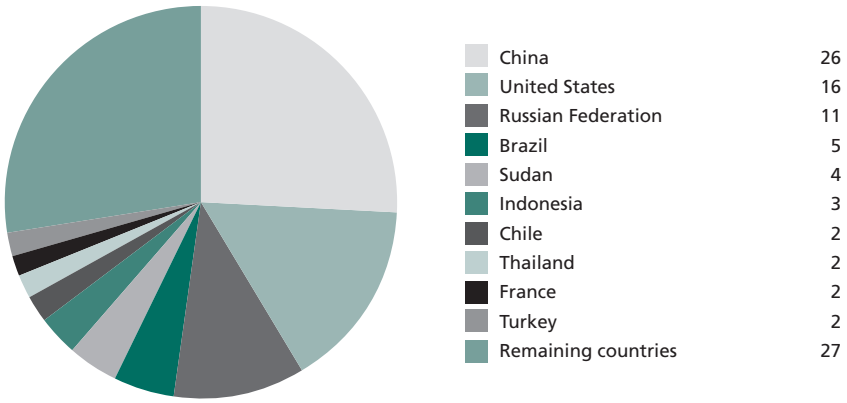


TABLE 5.4
Trends in area of productive forest plantations 1990–2005

Region/subregion	Information availability (all 3 years)			Area of productive forest plantations *(1 000 ha)*			Annual change *(1 000 ha)*	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	2005	1990–2000	2000–2005
Eastern and Southern Africa	18	214 589	94.7	2 544	2 712	2 792	17	16
Northern Africa	12	117 193	89.4	6 404	6 158	6 033	-25	-25
Western and Central Africa	16	99 414	35.8	1 099	1 453	1 853	35	80
Total Africa	**46**	**431 195**	**67.9**	**10 046**	**10 323**	**10 679**	**28**	**71**
East Asia	5	244 862	100.0	17 909	23 028	30 006	512	1 396
South and Southeast Asia	17	283 126	100.0	8 896	10 750	11 825	185	215
Western and Central Asia	22	43 443	99.7	2 120	2 428	2 583	31	31
Total Asia	**44**	**571 430**	**100.0**	**28 925**	**36 206**	**44 414**	**728**	**1 642**
Total Europe	**34**	**978 682**	**97.7**	**16 643**	**19 818**	**21 467**	**318**	**330**
Caribbean	12	4 090	68.5	239	243	280	0	7
Central America	7	22 411	100.0	51	183	240	13	12
North America	4	677 464	100.0	10 305	16 285	17 133	598	170
Total North and Central America	**23**	**703 965**	**99.7**	**10 595**	**16 711**	**17 653**	**612**	**189**
Total Oceania	**10**	**203 284**	**98.6**	**2 447**	**3 456**	**3 812**	**101**	**71**
Total South America	**11**	**768 723**	**92.4**	**8 221**	**10 547**	**11 326**	**233**	**156**
World	**168**	**3 657 281**	**92.5**	**76 826**	**97 061**	**109 352**	**2 018**	**2 458**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in the preceding table.

All subregions except Northern Africa show an increase in productive forest plantations. However, the annual change varies considerably among subregions. The greatest increase by far is in East Asia, mainly due to the reported large-scale establishment of forest plantations in China.

Table 5.5 presents trends for the ten countries with the largest area of productive forest plantations. Table 5.6 shows trends for the ten countries with the greatest annual increase in productive plantations.

China reported the greatest annual increase for the last five-year period, followed by the Russian Federation and the United States. These three countries together account for 71 percent of the global annual increase in productive forest plantations.

TABLE 5.5
Ten countries with largest area of productive forest plantations 1990–2005

Country/area	Area of productive forest plantations *(1 000 ha)*			Annual change *(1 000 ha)*	Annual change rate *(%)*
	1990	2000	2005	2000–2005	2000–2005
China	17 131	21 765	28 530	1 353	5.6
United States	10 305	16 274	17 061	157	0.9
Russian Federation	9 244	10 712	11 888	235	2.1
Brazil	5 070	5 279	5 384	21	0.4
Sudan	5 347	4 934	4 728	-41	-0.8
Indonesia	2 209	3 002	3 399	79	2.5
Chile	1 741	2 354	2 661	61	2.5
Thailand	1 979	1 996	1 997	n.s.	n.s.
France	1 842	1 936	1 968	6	0.3
Turkey	1 459	1 763	1 916	31	1.7

TABLE 5.6
Ten countries with greatest annual increase in productive forest plantation area 1990–2005

Country/area	Area of productive forest plantations *(1 000 ha)*			Annual change *(1 000 ha)*	Annual change rate *(%)*
	1990	2000	2005	2000–2005	2000–2005
China	17 131	21 765	28 530	1 353	5.6
Russian Federation	9 244	10 712	11 888	235	2.1
United States	10 305	16 274	17 061	157	0.9
Viet Nam	664	1 384	1 792	82	5.3
Indonesia	2 209	3 002	3 399	79	2.5
Chile	1 741	2 354	2 661	61	2.5
Australia	1 023	1 485	1 766	56	3.5
Portugal	383	867	1 067	40	4.2
Republic of Korea	748	1 188	1 364	35	2.8
Turkey	1 459	1 763	1 916	31	1.7

GROWING STOCK AND COMMERCIAL GROWING STOCK

Forest growing stock has traditionally been a key indicator of forest capacity for wood production and has formed part of global forest resources assessments since the very beginning. Although FRA 2005 broadened its scope to cover a range of forest benefits, growing stock was still a fundamental piece of information in this assessment, as well as being the basis for estimating biomass and carbon stocks for most countries.

Information from each country on total growing stock and forest area was used to estimate the growing stock per hectare. This is a good indicator of how well-stocked forests are, and the trends in this parameter indicate whether forests are becoming less or better stocked.

FRA 2005 also collected country information on commercial growing stock, i.e. the amount of wood that is considered commercial or potentially commercial. Usually, the commercial growing stock of a country refers to the volume of commercial trees growing in forests where the harvesting of wood is permitted.

Information availability

Of the 229 countries and areas covered by FRA 2005, 147 countries reported on growing stock for all three years, constituting 88 percent of global forest area (Figure 5.6). In most regions, countries have reported well. Only one region – Oceania – shows low reporting on growing stock (15 percent), because Australia did not provide information

on this indicator. With a few exceptions, reporting countries furnished information for all three reporting years. As regards commercial growing stock, 107 countries provided information for all three years (Figure 5.7).

Although many countries provide information on growing stock, the quality of the information is variable. A few countries with repeated national forest assessments have very reliable information, but many countries do not have good inventory data to support growing stock estimates and changes in growing stock over time. In many cases,

FIGURE 5.6
Information availability – growing stock

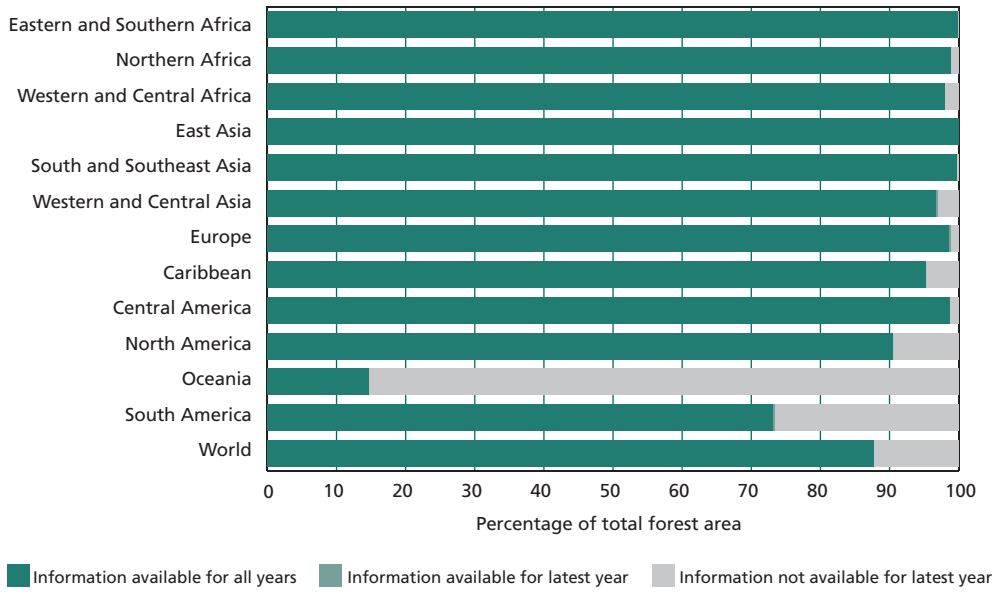
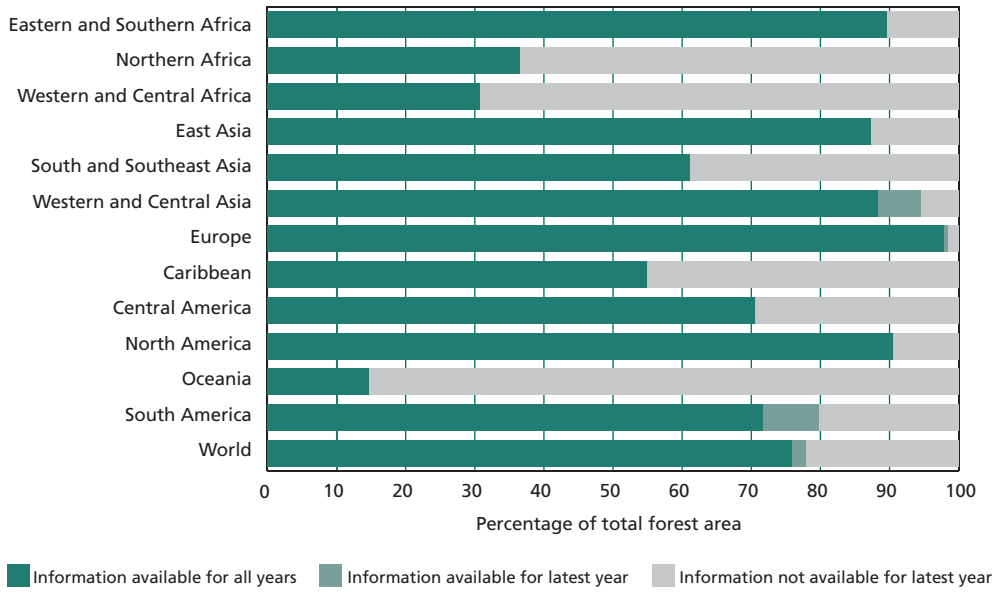


FIGURE 5.7
Information availability – commercial growing stock



a single estimate of growing stock per hectare has been used for all reporting years. Furthermore, the original data on which the estimates are based are often old and not representative of all forests in the country.

FRA 2005 defines growing stock as the standing volume of trees with a diameter at breast height (DBH) of at least 10 cm. However, countries may use national diameter thresholds if the limits are thoroughly documented. This helps countries report data consistently over time and allows for better trend estimates. The trade-off is that comparisons between individual countries become more difficult and that large, forest-rich countries with non-standard diameter thresholds may affect regional and subregional averages.

The analysis of growing stock as presented in Table 5.7 is based directly on the data provided in country reports. No further calculations were done to harmonize the figures to a common diameter threshold.

Status

In order to obtain global, regional and subregional estimates of total growing stock, the stock per hectare was estimated for each subregion for those countries providing information. These estimates were then applied to the total forest area of the subregion. Regional and global estimates were obtained by combining the subregional estimates.

Table 5.7 shows growing stock and growing stock per hectare for 2005. Total global growing stock is estimated at 434 billion m^3, of which about 30 percent is found in South America.

The global average for growing stock per hectare is 110 m^3 per hectare. South America, with 155 m^3 per hectare, and Western and Central Africa, with 189 m^3 per hectare, are significantly higher than average owing to some forest-rich countries reporting high volume (Brazil and the Democratic Republic of the Congo). Oceania, with 36 m^3 per hectare, is significantly lower than average, but few countries are reporting in this region and its estimates are heavily influenced by Papua New Guinea. This country reported low volume per hectare because it only included trees with a DBH above 50 cm in its growing stock estimates. Most countries with well-stocked forests are found in Europe. Of the 11 countries reporting an average growing stock of more than 250 m^3 per hectare, eight are in central Europe.

TABLE 5.7
Forest area and growing stock 2005

Region/subregion	Forest area *(1 000 ha)*	Growing stock	
		million m^3	m^3/ha
Eastern and Southern Africa	226 534	10 015	44
Northern Africa	131 048	2 523	19
Western and Central Africa	277 829	52 420	189
Total Africa	**635 412**	**64 957**	**102**
East Asia	244 862	19 743	81
South and Southeast Asia	283 127	24 202	85
Western and Central Asia	43 588	3 166	73
Total Asia	**571 577**	**47 111**	**82**
Total Europe	**1 001 394**	**107 264**	**107**
Caribbean	5 974	441	74
Central America	22 411	2 906	130
North America	677 464	75 235	111
Total North and Central America	**705 849**	**78 582**	**111**
Total Oceania	**206 254**	**7 361**	**36**
Total South America	**831 540**	**128 944**	**155**
World	**3 952 025**	**434 219**	**110**

The five countries with the greatest total growing stock (Figure 5.8) account for almost 261 billion m³, which corresponds to 60 percent of the global total. Of these, Brazil has the largest growing stock, with 81 billion m³ or 19 percent of the total.

Information on commercial growing stock was provided by 113 countries. For each subregion, commercial growing stock was estimated as a percentage of the total growing stock of reporting countries, and these percentages were applied to the total growing stock estimates for each subregion. The results are presented in Table 5.8.

Global commercial growing stock amounts to some 202 billion m³, which represents about 47 percent of total growing stock. In absolute terms, Europe and North and Central America account for about 130 billion m³ or 64 percent of global commercial growing stock. In relative terms, there are some important regional differences. Commercial growing stock constitutes a lower percentage of total growing stock in tropical regions (e.g. Africa, Central America and South America) than in temperate regions (East Asia, Europe and North America). This is mainly because of differences in the characteristics of the forests in terms of species diversity and different harvesting regimes. Tropical forests are very rich in species of which only a few are considered

FIGURE 5.8
Five countries with greatest total growing stock 2005
(%)

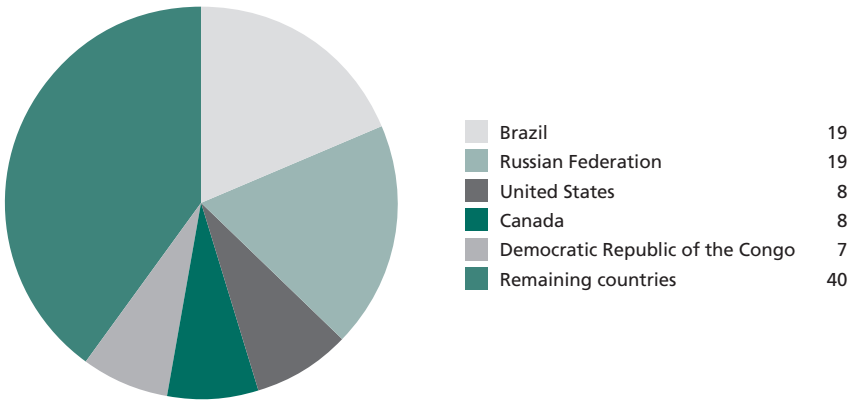


TABLE 5.8
Commercial growing stock 2005

Region/subregion	% of total growing stock	million m³
Eastern and Southern Africa	22	2 234
Northern Africa	30	767
Western and Central Africa	26	13 407
Total Africa	**25**	**16 408**
East Asia	86	17 065
South and Southeast Asia	34	8 160
Western and Central Asia	60	1 890
Total Asia	**58**	**27 115**
Total Europe	**57**	**61 245**
Caribbean	64	283
Central America	19	563
North America	89	66 968
Total North and Central America	**86**	**67 815**
Total Oceania	**51**	**3 751**
Total South America	**20**	**25 992**
World	**47**	**202 325**

commercial, and harvesting is usually carried out through selective logging in which only trees above a certain minimum diameter are cut. Temperate forests are dominated by a smaller number of species of which many are commercial. Moreover, the harvesting regime in temperate forests is generally not based on minimum diameters, which means that most of the growing stock in areas available for wood supply can be considered commercial.

Trends

Tables 5.9 and 5.10 show trends by region and subregion for growing stock per hectare, total growing stock and commercial growing stock. At the global level, there is a slight decrease in total growing stock for the reporting period. There are some regional tendencies: Africa, Asia, Oceania and South America show a slight decrease, while Europe and North and Central America show a slight increase.

As regards growing stock per hectare, changes at the global level are not significant. At regional and subregional levels, however, there are more significant changes. For example, Europe, excluding the Russian Federation, shows a net increase of 1.2 m^3 per hectare annually for the last 15-year period, while South and Southeast Asia show a net decrease of 1.0 m^3 per hectare annually, mainly due to a decrease in growing stock per hectare in Indonesia.

Changes in total growing stock reflect the combined effects of changes in forest area and in growing stock per hectare. However, for many countries, changes in growing stock only reflect the changes in forest area, because their estimates of growing stock are based on a single figure per hectare determined at one point in time. Thus the actual trends may be more pronounced than what is seen in this analysis.

The trends for commercial growing stock are shown in Table 5.10. At the global level, there is a small decrease in commercial growing stock, mainly due to the decrease in Europe during 1990–2000. The other regions show only small changes. When commercial growing stock is expressed as a percentage of total growing stock, the global pattern is the same, although some subregions (e.g. the Caribbean and South and Southeast Asia) show more pronounced trends.

TABLE 5.9
Trends in growing stock and growing stock per hectare 1990–2005

Region/subregion	Growing stock						Annual change rate *(m^3/ha)*
	million m^3			m^3/ha			
	1990	2000	2005	1990	2000	2005	1990–2005
Eastern and Southern Africa	11 035	10 346	10 015	44	44	44	n.s.
Northern Africa	2 771	2 607	2 523	19	19	19	n.s.
Western and Central Africa	55 566	53 218	52 420	185	187	189	0.3
Total Africa	**69 373**	**66 171**	**64 957**	**99**	**101**	**102**	**0.2**
East Asia	15 850	18 433	19 743	76	82	81	0.3
South and Southeast Asia	32 615	27 296	24 202	101	92	85	-1.0
Western and Central Asia	2 959	3 105	3 166	69	71	73	0.3
Total Asia	**51 423**	**48 834**	**47 111**	**90**	**86**	**82**	**-0.5**
Total Europe (incl. Russian Federation)	**102 063**	**105 374**	**107 264**	**103**	**106**	**107**	**0.3**
Total Europe (excl. Russian Federation)	**22 024**	**25 103**	**26 785**	**124**	**135**	**141**	**1.2**
Caribbean	328	403	441	61	71	74	0.8
Central America	3 585	3 097	2 906	130	130	130	n.s.
North America	72 542	74 227	75 235	107	109	111	0.3
Total North and Central America	**76 455**	**77 727**	**78 582**	**108**	**110**	**111**	**0.3**
Total Oceania	**7 593**	**7 428**	**7 361**	**36**	**36**	**36**	**n.s.**
Total South America	**138 344**	**133 467**	**128 944**	**155**	**157**	**155**	**n.s.**
World	**445 252**	**439 000**	**434 219**	**109**	**110**	**110**	**n.s.**

TABLE 5.10
Trends in commercial growing stock 1990–2005

Region/subregion	Commercial growing stock					
	million m³			% of total growing stock		
	1990	2000	2005	1990	2000	2005
Eastern and Southern Africa	2 519	2 321	2 234	23	22	22
Northern Africa	754	762	767	27	29	30
Western and Central Africa	13 336	13 162	13 407	24	25	26
Total Africa	**16 609**	**16 245**	**16 408**	**24**	**25**	**25**
East Asia	14 013	15 976	17 065	88	87	86
South and Southeast Asia	12 705	9 717	8 160	39	36	34
Western and Central Asia	1 813	1 867	1 890	61	60	60
Total Asia	**28 531**	**27 561**	**27 115**	**55**	**56**	**58**
Total Europe	**66 063**	**60 648**	**61 245**	**65**	**58**	**57**
Caribbean	175	245	283	53	61	64
Central America	717	599	563	20	19	19
North America	64 816	66 376	66 968	89	89	89
Total North and Central America	**65 709**	**67 220**	**67 815**	**86**	**86**	**86**
Total Oceania	**3 849**	**3 777**	**3 751**	**51**	**51**	**51**
Total South America	**28 059**	**26 666**	**25 992**	**20**	**20**	**20**
World	**208 820**	**202 116**	**202 325**	**47**	**46**	**47**

REMOVALS OF WOOD PRODUCTS

Wood products removed from forests and other wooded land constitute an important component of the productive function. The volume of wood removed indicates the economic and social utility of forest resources to national economies and local communities. This information contributes to monitoring the use of forest resources by comparing actual removal with the sustainable potential.

Wood removals are influenced by a number of factors. The following ones should be considered in order to better understand the removal figures from various countries:

- organizational issues, such as legal forms of harvesting, ownership of forest land and logging companies, and availability of forest management plans;
- harvesting systems (clear-cut, polycyclic, diameter limit and species grouping), practices and intensity; illegal logging; and the environmental impact of harvesting;
- institutional framework conditions, which may differ among countries in terms of timber extraction fees, forest law compliance, subsidies and incentives for forest management or non-transparent concession agreements;
- governance issues and the ability to detect and prevent illegal logging.

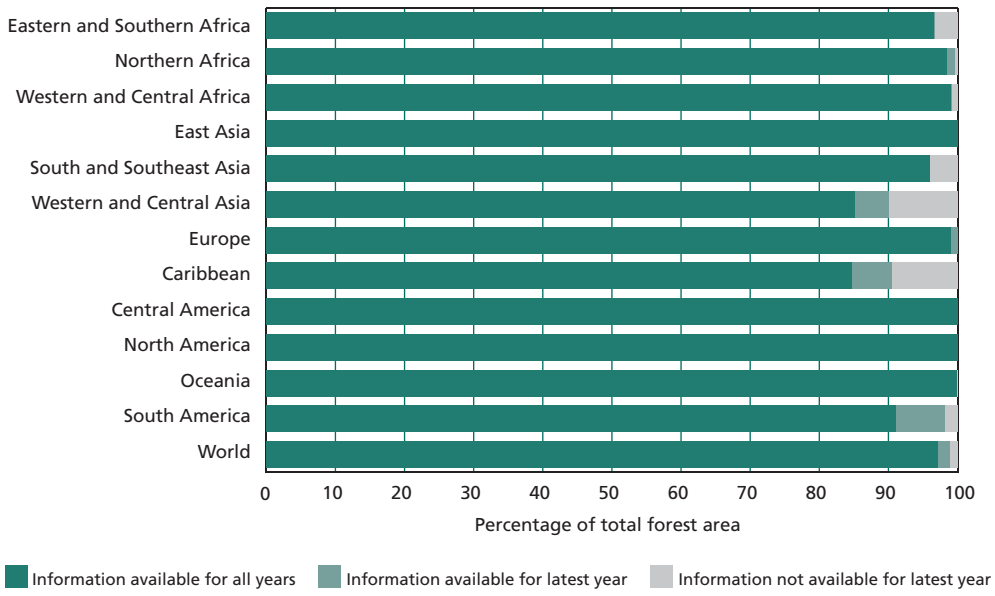
In FRA 2005, reported wood removals from forests and other wooded land cover both industrial roundwood and fuelwood. The data on fuelwood are included because wood is the main source of fuel for cooking and heating in many parts of the world.

For 1990 and 2000, the data reported are five-year averages for 1988–1992 and 1998–2002 respectively. The data for 2005 are forecasts, taking into account the most recent country information available.

Information availability

A total of 167 countries reported on wood removals (Figure 5.9). In terms of forest area, they account for about 99 percent at the global level; non-reporting countries are mostly those with little or no forest area. One reason for the high reporting rate may be that available FAOSTAT data on wood removals were provided to countries for use if no new and better data were available.

FIGURE 5.9
Information availability – wood removals



Globally, quantitative data on wood removals are often based on population figures and consumption estimates, and are weak for this reason. In particular, reported fuelwood removals from several tropical forest countries with significant forest cover and large populations show remarkable deviations from the figures reported by other sources, e.g. FAOSTAT. Such deviations between sources indicate that there are uncertainties that should be considered in using these figures.

Countries usually do not report illegal removals and informal fuelwood gathering, and thus the figures for removals might be much higher than those reported.

Status

Wood removals for 2005 by region and subregion are presented in Table 5.11. Global wood removals in 2005 amount to just over 3 billion m^3, of which about 60 percent is industrial roundwood and 40 percent fuelwood. These figures refer to forest only. An additional 7 million m^3 of fuelwood globally was reported from other wooded land. However, the data behind this figure come from a small number of countries and thus do not allow for a breakdown by region and subregion.

In Africa, the Caribbean, Central America and South and Southeast Asia, removals are mainly fuelwood, while in Central and North America, East Asia, Europe and Oceania, removals are mainly industrial roundwood.

Some 40 countries account for up to 90 percent of the removals in tropical forests.

The five countries reporting the highest figures on wood removals account for 45 percent of total global removals (Figure 5.10).

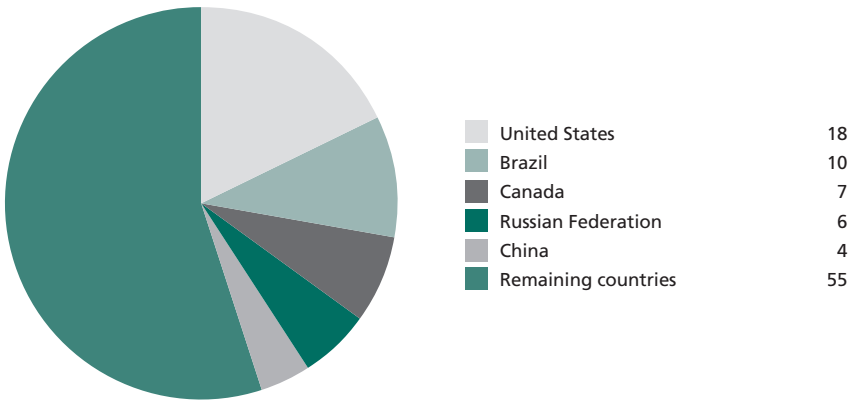
Trends

The trend figures in Table 5.12 are based on those countries that reported a complete time series on wood removals. Global removals show a relatively stable development, without significant changes over the last 15 years. Nor did the proportion between industrial roundwood and fuelwood (60 to 40 percent) change significantly between reporting periods.

TABLE 5.11
Wood removals 2005

Region/subregion	Industrial roundwood	Fuelwood		Total removals
	million m³	million m³	% of total	million m³
Eastern and Southern Africa	34	151	82	185
Northern Africa	8	173	96	181
Western and Central Africa	36	267	88	303
Total Africa	**79**	**591**	**88**	**670**
East Asia	115	56	33	171
South and Southeast Asia	44	113	72	157
Western and Central Asia	15	20	57	34
Total Asia	**174**	**189**	**52**	**362**
Total Europe	**543**	**139**	**20**	**681**
Caribbean	4	16	82	19
Central America	4	40	90	45
North America	717	56	7	773
Total North and Central America	**725**	**112**	**13**	**837**
Total Oceania	**54**	**10**	**15**	**64**
Total South America	**225**	**173**	**44**	**398**
World	**1 799**	**1 214**	**40**	**3 013**

FIGURE 5.10
Five countries with largest volume of wood removals 2005
(%)



Eastern and Southern African countries reported steadily increasing wood removals: from 153 million m³ in 1990 to 185 million m³ in 2005. Only Madagascar reported a decrease, owing to a reduction in removals of fuelwood. Northern, Western and Central Africa also show a steady increase in removals, with the African continent as a whole reporting an escalation from 499 million m³ (1990) to 661 million m³ (2005).

East Asia reported a decline in removals, caused primarily by a significant decrease in China as the result of a logging ban. Decreases were also reported in India, Indonesia and Malaysia in the South and Southeast Asia region. For Asia as a whole, the reduction in removals was significant, from 454 million m³ in 1990 down to 362 million m³ in 2005.

Some European countries show a slight decrease, mainly due to reduced removals of fuelwood in certain countries. However, after a decrease in the 2000 reporting period, the figures are again moving towards the level of 1990.

North and Central America show a very stable development over the last 15 years: Removals decreased slightly from 855 million m³ in 1990 to 837 million m³ in 2005.

TABLE 5.12
Trends in wood removals 1990–2005

Region/subregion	Wood removals *(million m³)*								
	Industrial roundwood			Fuelwood			Total		
	1990	2000	2005	1990	2000	2005	1990	2000	2005
Eastern and Southern Africa	29	32	34	125	146	151	153	177	185
Northern Africa	6	7	8	134	159	170	140	166	178
Western and Central Africa	19	29	33	187	242	264	206	272	297
Total Africa	**54**	**69**	**75**	**445**	**547**	**585**	**499**	**616**	**661**
East Asia	131	116	115	70	60	56	201	176	171
South and Southeast Asia	94	62	44	118	113	113	212	175	157
Western and Central Asia	14	14	15	27	22	19	41	36	34
Total Asia	**239**	**192**	**174**	**215**	**195**	**189**	**454**	**387**	**362**
Total Europe	**606**	**488**	**535**	**138**	**126**	**136**	**743**	**614**	**672**
Caribbean	4	3	4	17	16	16	20	20	19
Central America	3	4	4	30	37	40	32	42	45
North America	697	716	717	105	56	56	802	772	773
Total North and Central America	**703**	**724**	**725**	**151**	**109**	**112**	**855**	**833**	**837**
Total Oceania	**34**	**47**	**54**	**10**	**12**	**10**	**44**	**59**	**64**
Total South America	**144**	**207**	**224**	**302**	**183**	**173**	**446**	**390**	**398**
World	**1 780**	**1 726**	**1 787**	**1 261**	**1 173**	**1 206**	**3 041**	**2 899**	**2 993**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in the preceding table.

A steady increase was reported for Oceania. Australia, New Zealand and Papua New Guinea account for most wood removals, which have gone from 44 million m³ in 1990 to 64 million m³ in 2005, owing to an increase in industrial roundwood. South America reported a significant reduction, from 446 million m³ in 1990 to 398 million m³ in 2005.

REMOVALS OF NON-WOOD FOREST PRODUCTS

There has been growing recognition of – and expectations for – the role of NWFPs as an integral part of sustainable forest management in developed and developing countries. FAO has defined NWFPs as follows: "Non-wood forest products consist of goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests." They perform a crucial role in meeting the subsistence needs of a large part of the world's population living in or near forests and in providing them with supplementary income-generating opportunities.

A wide variety of products are collected from forests, woodlands and trees outside forests – a major portion of which are consumed by households or sold locally, while some find export markets. Various products have been domesticated and are being cultivated; in fact, the border between NWFPs and agricultural crops is becoming increasingly blurred. The absence of a uniform classification system and limited human/financial resources in the national institutions dealing with NWFPs make the gathering and reporting of data a challenge.

Understanding the potential contribution of NWFPs to sustainable rural development, especially in poverty alleviation and food security, requires good statistical data, which in most cases are gathered sporadically and are often unreliable. However, FAO recognizes the importance of NWFPs to social, economic and environmental contexts and is attempting to draw a global picture based on the best available information. For this reason, FRA 2000, for the first time, included a section on the status of NWFPs, and FRA 2005 seeks to provide additional quantitative information on the amount and value of NWFP removals.

Information availability

Systematic data collection on NWFPs at the national level is rare, although their significant contribution to local livelihoods is well understood empirically. For FRA 2005, countries were asked to report on removals of 16 categories of NWFPs.

In total, 71 countries reported data on removals of at least one NWFP category, and many of these reported for one reporting year only. Many countries did not report any data or only for one or a few categories. Even where national statistics exist, all removals are not always recorded, so the figures reported are in many cases considered underestimates.

Figure 5.11 shows the availability of information in terms of the forest area that NWFP reporting countries represent. At the global level, they encompass 63 percent of total forest area. East Asia and Europe have better availability, and the reporting countries in these subregions cover more than 90 percent of the forest area.

Figure 5.12 shows the availability of information for each specific category of NWFP. Four categories show significantly higher information availability than the others: food, raw materials for medicine and aromatic products, exudates and other plant products. Still, the countries reporting on these four categories only represent 45–55 percent of the global forest area. For the remaining categories, the availability of information is weak, at least at the global level.

Most of the removal data provided are based mainly on commercial figures, but many NWFPs are used and consumed non-commercially. Thus it is assumed that the real removal figures are considerably higher than those provided for FRA 2005.

Regarding the quality of the information, it is important to bear in mind that the figures given in the country reports (even though reported using the same template) may reflect differences in the way data were collected. Asia and Europe show the greatest availability of information. In fact, Asia has traditionally used NWFPs and often includes them in official national accounts and international trade statistics. This is not generally the case in other regions. Thus aggregation of the reported figures and the drawing of any far-reaching conclusions should be avoided or done with extreme care.

FIGURE 5.11
Information availability – NWFP removals

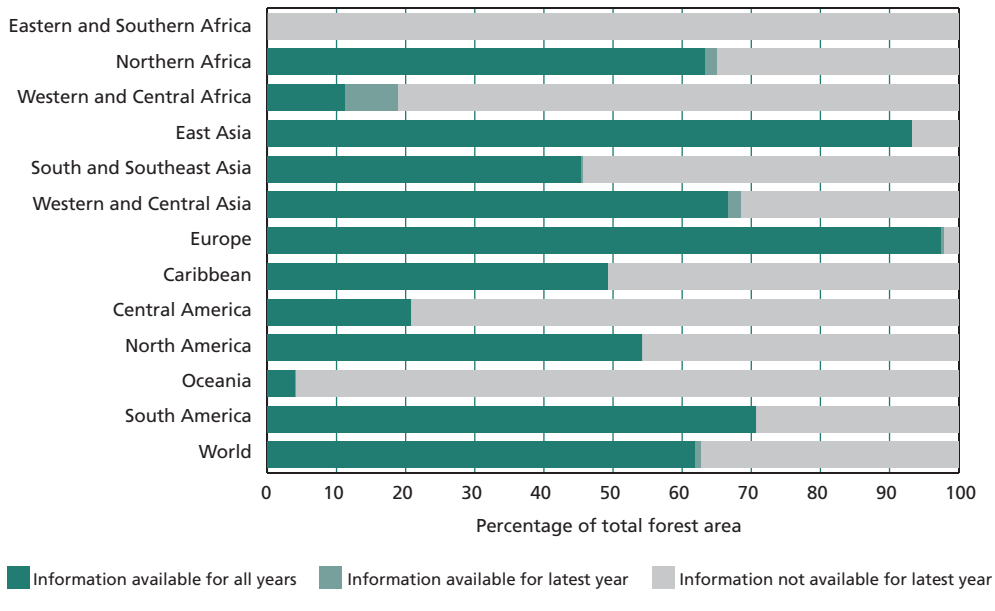


FIGURE 5.12
Information availability – NWFP removals by product category

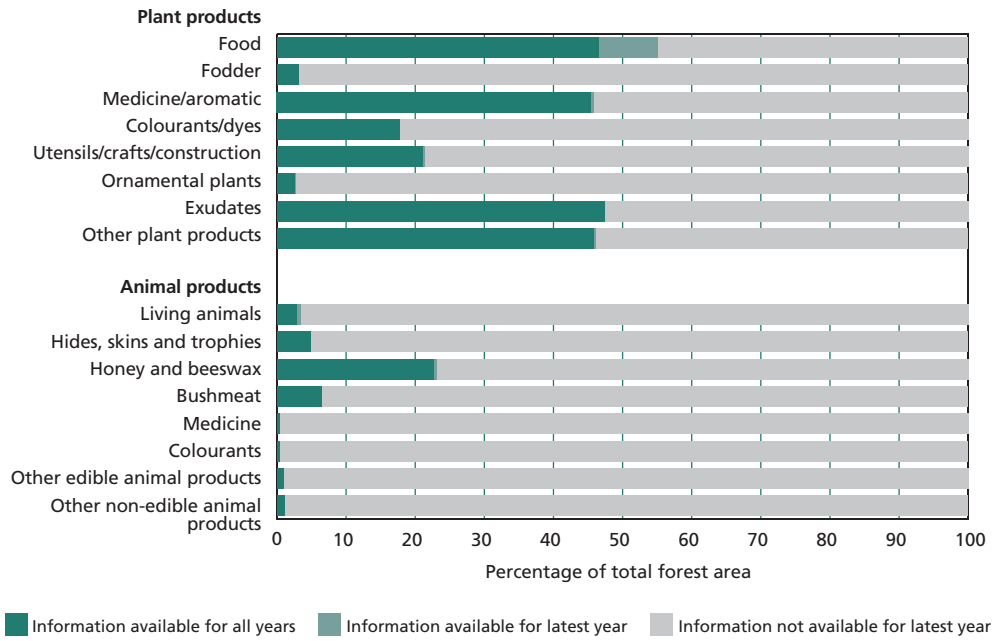


TABLE 5.13
Removals of four categories of NWFPs (plant products) 2005 ***(tonnes)***

Region	Food	Raw material for medicine and aromatic products	Exudates	Other plant products
Africa	88 823	20 400	12 757	11 175
Asia	3 562 991	90 181	1 495 663	606 782
Europe	272 418	6 530	2 216	231 765
North and Central America	6 443	2 867	38 733	149 231
Oceania	-	38	0	5 900
South America	348 259	1 490	17 315	291 966
World	**4 278 935**	**121 505**	**1 566 684**	**1 296 819**

Status

Table 5.13 indicates the four categories of NWFP removals for which the most information is available. As quantities have been calculated for reporting countries only, the regional and world totals are underestimates.

According to the figures reported to FRA 2005, among these four best-covered categories, Asia accounts for the largest removals. With a share of 74 percent, China has by far the world's largest removals of forest plant products for food, consisting mainly of oil seeds, nuts and bamboo shoots. Other countries with significant removal volumes for food are India, the Republic of Korea and Pakistan in Asia; the Czech Republic, Finland, Italy and Sweden in Europe; and Brazil in South America.

China also accounts for 72 percent of removals in the category of exudates, such as tannin extract and raw lacquer, followed by Viet Nam. In the category of plant raw materials for medicinal and aromatic uses, India accounts for half of reported global removals, mainly consisting of medicinal plants and spices. India also has a 42 percent share of total removals in the category of other plant products, such as tendu leaves and lac, followed by Brazil and Mexico.

TABLE 5.14
Annual changes for four categories of NWFPs (plant products) per region 1990–2005 *(%)*

Region	Food		Medicine/aromatics		Exudates		Other plant products	
	1990–2000	2000–2005	1990–2000	2000–2005	1990–2000	2000–2005	1990–2000	2000–2005
Africa	-0.2	0.9	-2.4	-4.2	11.0	9.9	4.0	-3.5
Asia	6.0	4.8	7.2	0.4	2.6	1.0	0.7	-1.5
Europe	-0.6	-0.1	-6.9	5.3	-7.4	-13.6	0.4	-0.3
North and Central America	-	-	-0.1	0.9	0.3	0.5	0.8	0.7
Oceania	-	-	-	-	-	-	1.6	0.3
South America	-2.7	-1.9	-1.5	-3.1	-6.5	-3.2	1.6	-7.5
World	**3.9**	**3.8**	**3.0**	**-0.3**	**2.3**	**1.0**	**1.0**	**-2.9**

For the remaining categories of NWFPs, information was provided by a limited number of countries, so calculation of regional totals is not meaningful. However, some particular aspects may be highlighted.

Fodder removals were reported by only 16 countries. Nevertheless, those countries reported very large quantities, particularly in Asia, indicating that this is a very important product category, however severely under-reported. Raw materials for utensils, crafts and construction, such as bamboo and rattan, were reported in large quantities from countries such as India and Myanmar. Ornamental plants – Christmas trees among them – were reported in large quantities from a number of European countries.

Among animal products, a few African and European countries reported large quantities of live animals, hides, skins and trophies, as well as wild honey and beeswax. The reported figures for edible animals (game and bushmeat) are concentrated in Europe, with 98 percent of the global total. It is well known, however, that bushmeat is an important source of food in many African countries, but these reported very few figures.

Trends

Table 5.14 shows the changes in removals for the four best-covered categories between 1990 and 2000 and between 2000 and 2005. The table is based exclusively on data from countries providing values for all three reporting years. Increasing trends are seen for food and exudates, while both increases and decreases are seen for raw materials of medicines and aromatics and for other plant products. The increase seen between 1990 and 2000 appears to have slowed in recent years, although this may be due to the limited data available and the use by some countries of figures for 2000 as estimates for 2005.

Chapter 6

Protective functions of forest resources

OVERVIEW

Early assessments of forest resources were focused on the productive functions of forests, particularly wood supply, as this was the main issue identified by policy-makers. In response to increased awareness in many countries of the important role of forests in providing environmental services including protection – and consistent with the overall concept of sustainable forest management – FRA 2005 also evaluates trends in those forest resources with a protective function.

Each succeeding FRA has given more attention to environmental services. While demand for wood has remained static or increased only slightly and demand for non-wood forest products (NWFPs) has increased steadily but slowly, the demand for environmental services of forests – largely unmonetized – has burgeoned (Leslie, 2005). Many of these services have to do with the protective role of forests.

The world's forests have many protective functions, some local and some global.

Influence on climate. Forests affect climate globally by reflecting less heat back into the atmosphere than other types of land use that have more bare soil and less green cover. They also play a very significant role in the global carbon cycle that affects global climate change (see Chapter 2). Locally, in both cities and rural areas, trees provide shade and absorb heat energy, producing a cooling effect. During the cold season, they obstruct, filter and deflect wind, reducing wind chill. Windbreaks of trees can reduce evaporative losses from small water bodies. These functions of reducing wind velocity, moderating soil temperature and increasing relative humidity are also beneficial in agroforestry systems (Vergara and Briones, 1987).

Protection from wind erosion. Wind-rows and shelterbelts reduce the loss of nutrient-rich topsoil and protect young plants from wind within their zone of influence. They also help stabilize dunes.

Coastal protection. Coastal forests, particularly mangroves, reduce shoreline erosion and siltation and the impacts of storm surges and tsunamis. Mangroves also filter and remove some of the nutrients and heavy metals coming from upstream land uses and industry, immobilizing them in the mud – as long as they prove non-toxic to the mangroves themselves (Wharton *et al.*, 1976). Salt-spray barriers of salt-tolerant trees have been planted along windward coasts to protect crops.

Protection from avalanches. The Alpine countries in Europe have had much experience with protection from snow avalanches by forests and have many forests designated for this purpose. As more tourism and infrastructure enter the mountain areas of other countries, this function of forests should be increasingly recognized.

Air-pollution filters. Trees perform a valuable role in intercepting and trapping windborne particulate matter – again, as long as the pollution does not damage or kill them. This is one of the benefits of urban forests and greenbelts. Dust, ash, pollen and smoke that adversely affect human health and visibility can be 'raked' from the atmosphere, then washed to the ground by rainfall or snow.

Protecting water resources. Forests protect water by reducing surface erosion and sedimentation, filtering water pollutants, regulating water yield and flow, moderating floods, enhancing precipitation (e.g. 'cloud forests') and mitigating salinity. Additional information on forests and water is presented in a separate thematic study (Box 6.1).

BOX 6.1

FRA 2005 thematic study on forests and water

Since quantitative information on the role of forests in protecting water supply is rare, with few statistics available, a qualitative thematic study on forests and water was carried out as part of FRA 2005. The report of the study is being completed for release during 2006. It highlights the following main points:

Reduction of soil erosion as it affects water

One of the most effective protective functions of forests is reducing soil erosion by water, which degrades water quality. Soil erosion on sloping land is generally of two major types: surface erosion and 'mass wasting'. Forests have a beneficial role in both types.

Surface erosion includes sheet, rill and small gully erosion, and is at a minimum in forests, with their understorey trees, shrubs and ground cover, and their forest floor debris. In fact, the small trees, understorey and litter protect soil from the impact of falling raindrops (soil dislodgement and splash erosion), overland flow of rainwater as a sheet, or channelling into rills and gullies (Hamilton and King, 1983; Wiersum, 1984). It is the removal of this ground protection, rather than removal of the tree canopy over 10 m high, that results in accelerated erosion. These uncompacted forest soils also have the highest infiltration rates and storage capacities, which reduce the frequency and degree of overland flow. Any activity that bares or compacts the soil reduces the protective role of forests to varying degrees, e.g. tree extraction, litter collection, grazing in forestland and fires. The more intensively forest is used, the greater the potential for erosion. If forest harvesting is contemplated, good management can minimize this impact.

Mass wasting consists of landslips, slumps and debris flows (landslides) and, again, forests are the most effective vegetative cover for minimizing these soil movements, particularly shallow landslips and slumps. The mechanisms are the root shear strength and the lowering of pore pressure (O'Loughlin, 1974). Slip-prone areas can be identified in land-use planning, and forest retention is warranted on these sites.

Sediment. The product of erosion is sediment, which has adverse impacts during transport in flowing water and as a deposit in stream channels or standing water bodies (such as ponds, lakes and reservoirs). Sediment can harm or kill valuable aquatic life; impair water quality for drinking, domestic use or industry; reduce reservoir capacity for flood control, hydropower, irrigation or low flow augmentation; interfere with navigation; shorten the useful life of hydro-turbines or pumps; and build up river channel beds, aggravating flooding (Hamilton and Pearce, 1991). Thus the protective role of forests in reducing erosion on-site has a far-reaching, off-site effect through reduced sedimentation.

Influence on water regulation

The influence of forests and forest alteration on water yield and timing is complex. Where forests were the original land cover, the protective effect consists in maintaining as far as possible the 'natural' flow regime, which inevitably consisted of both flooding and low flows to which stream channels and associated biota were adjusted. With human intervention and occupancy, there is a need for better understanding of the forest/water interaction. With regard to floods, it is now quite clear that forests reduce stormflow peaks and delay them better than other land cover, but that this effect occurs close to a forest and diminishes further downstream in the watershed (Hamilton and King, 1983). On major rivers, headwater forests have little or no effect in reducing flood intensity in the downstream reaches (Hewlett, 1982; FAO, 2005f). But close to the protective forest, the frequent, lower intensity storms are ameliorated more than with other land covers or land uses, to the benefit of local people.

Forests absorb larger amounts of soil moisture than other vegetation, owing to greater canopy evaporation and deeper roots. In most cases, tree removal results in greater low flows during the dry season, but the other protective values are lost if trees are removed "to make more water" (Hamilton and King, 1983). Forest removal has at times been advocated to increase water availability. Indeed, where reforestation has occurred in grasslands or semi-arid areas, the water demand by these forests has in some cases been a harmful and unintended consequence. This has led to oversimplified and exaggerated popular articles against the use of trees for water regulation.

Precipitation-enhancing cloud forests

Montane cloud forests have a special protective role with regard to water resources; they capture horizontally moving fog moisture in areas of persistent wind-blown clouds. This water capture and the low evapotranspiration of cloud forests add water to the watershed above normal vertical precipitation. These forests occur in the tropics and subtropics in bands or zones of frequent cloudiness and wind, at elevations of from 2 000–3 000 m on continental mountains to as low as 500 m on oceanic islands and in coastal situations. The additional water capture ranges from 15–20 percent of ordinary rainfall in humid areas (2 000–3 000 millimetres per year) up to 50–60 percent for exposed ridge tops and areas of lower precipitation (Bruijnzeel and Hamilton, 2000). Where fog/cloud situations exist in dry seasons or locations, 100 percent and higher additions have been recorded.

Riparian forests

Protecting stream and river banks from undue horizontal erosion is only one function of a buffer zone of trees along both sides of a watercourse. The buffer area also acts as a filter and depository for sediment, pesticides and fertilizers from upslope land use. It may also reduce water temperatures through shading, thereby improving conditions for many forms of aquatic life. Several countries find this protective function so compelling that they have established 'green stream corridors' or they protect such corridors through zoning regulations, including mandatory practices in logging. This trend merits being continued and accelerated.

Forests mitigating salinity

Secondary salinity, as opposed to natural (or primary) salinity, can be caused by the removal of forests. Reduction of the evapotranspiration of deep-rooted trees causes a rise in the water table. In areas in which salts are present in the lower layers of the soil, this higher water table can bring salts into the root zone and adversely affect plant growth, even proving toxic. This is especially critical where clearing and establishment of crops is attempted. It is estimated that perhaps 7 percent of the agricultural area of western Australia is suffering from such secondary salinization in lands formerly forested (Ghassemi, Jakeman and Nix, 1995). Moreover, saline water draining from such areas can adversely impact downstream or downslope usefulness of water. Reforestation in these areas has made salinized land useful once again. Forests are thus playing a protective role in areas prone to soil salinization. Wood harvesting, followed by regeneration, should not result in salinity as long as clear-felled areas are not extensive.

Conclusions

In view of the critical importance of water in adequate quantity and quality to meet human needs, and the direct and indirect roles of forests in protecting these attributes, managers and policy-makers need to consider carefully the impacts of forest removal or alteration and forestation on water resources. To this end, the FRA 2005 thematic study on forests and water sets forth guidelines for each of a number of major situations in which the forest/water interaction is strong.

Many countries have identified forest areas that serve a protective function and have given them special status, e.g. avalanche protection, watershed reserve, natural catchment area or multiple-use management area. Maintenance of these environmental services, including protective functions, looms large among the management objectives of the IUCN Category System for Protected Areas (1994). This is the system of nomenclature most widely accepted and adopted throughout the world (Table 6.1), and efforts are underway to determine how it can be appropriately applied to the protective functions of the forest estate.

Forests in all categories, whether they be in national parks or marine/coastal reserves, perform some of the protective functions discussed above. For example, a watershed reserve might fall within Category I (Strict Protection) or Category VI (Managed Resource Protection Area). Yet not all protected areas have protection of soil and water as their main objective. Many are primarily established for the conservation of biological diversity or natural/cultural features. Conversely, some forests that have protection as their primary management objective may not form part of a protected area network, e.g. plantations established to combat desertification. The area of forest in protected areas is thus not necessarily a good measure of the protective functions of forests.

Data for two variables in FRA 2005 provide some indication of the role of protective forests and are reviewed in this chapter:

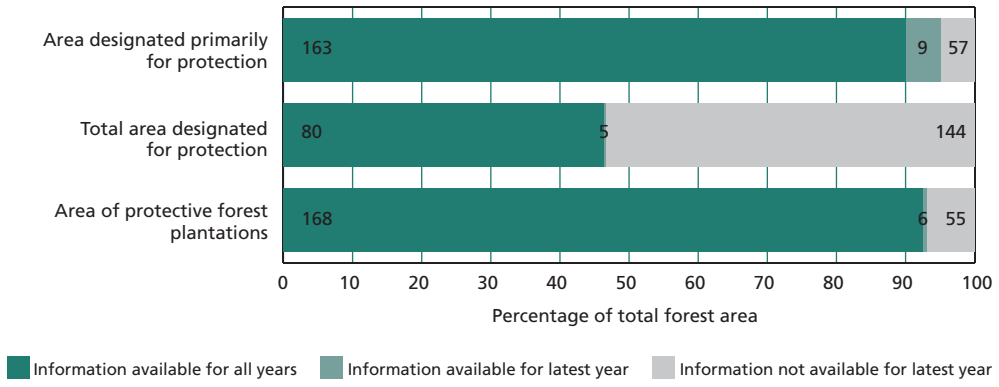
- area of forest designated for protective purposes (as the primary function or as one of several functions);
- area of protective forest plantations.

Limited quantitative information for these variables is available (Figure 6.1), but an initial evaluation has been made of the importance of the protective functions of forests.

TABLE 6.1
Protected area categories and management objectives

IUCN World Commission on Protected Areas Categories (IUCN, 1994)
I. Strict protection
(a) (Strict Nature Reserve)
(b) (Wilderness Area)
II. Ecosystem conservation and recreation (National Park)
III. Conservation of natural features (Natural Monument)
IV. Conservation through active management (Habitat/Species Management Area)
V. Landscape/seascape conservation and recreation (Protected Landscape/Seascape)
VI. Sustainable use of natural ecosystems (Managed Resource Protected Area)

FIGURE 6.1
Information availability – protective functions of forest resources



Note: Figures present number of countries in each category.

KEY FINDINGS

In 2005 the extent of forests with protection as their designated primary function was 348 million hectares – or 9 percent of the global forest area. At the same time, 1 190 million hectares of forest were identified as having a protective function as one of the designated functions (not necessarily the primary function).

The findings of FRA 2005 suggest that there is a trend towards increasing identification and designation of areas for forest protection. For the world as a whole, the percentage of forest with protection as the primary function increased from 8 percent in 1990 to 9 percent in 2005 – equivalent to an increase of more than 50 million hectares since 1990. Similarly, the proportion of the world's forests having a protective function as one of the designated functions increased from 61 percent in 1990 to 65 percent in 2005 – or an increase of close to 60 million hectares.

It would seem likely that the trend for a greater proportion of the world's forests to be classified as having "a primary function of protection" will continue, and that FRA 2010 will show more than 9 percent in this category.

On a global basis, the protective forest plantation area increased by 405 000 ha per year during 1990–2000 and by 330 000 ha per year during 2000–2005. The proportion of protective forest plantations increased from 0.63 percent of total forest area in 1990, through 0.75 percent in 2000, to 0.82 percent in 2005. However, regions and subregions reported changes that varied markedly.

In view of the many protective functions of forests and their growing importance, it is becoming increasingly necessary for countries to gather, analyse and present information on the extent and condition of 'protective forests'. All forests and woodlands, even 'productive' forests, have varying degrees of protective roles, and the protective values could often be enhanced by some alteration of the management regime. While this might result in giving up or expending some direct monetary value (for example, foregoing harvesting on critical sites or upgrading harvesting practices), the value of these environmental services to human welfare, health and economies is being increasingly recognized. Environmental or ecological economics is providing new tools for monetizing these services (see, for example, Landell-Mills and Porras, 2002).

FRA 2005 is a first attempt at evaluating the importance of the protective functions of forests at the global level and is based on a limited number of quantitative variables. Nevertheless, these variables all show a positive trend, indicating an increased recognition of the importance of the protective functions provided by forests.

FOREST AREA DESIGNATED FOR PROTECTIVE PURPOSES

This variable indicates to what extent forest areas have been set aside for protective purposes, either by legal prescription or by decision of the landowner or manager.

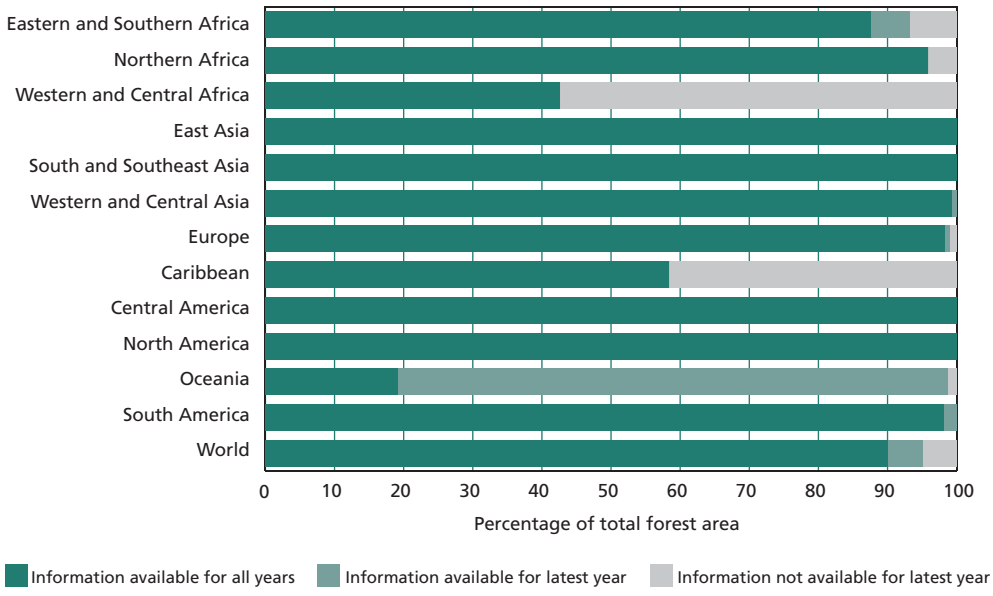
Forest designation is reported in two ways: 'primary function' and 'total area with function'. Forest areas with a specific, designated function considered to be significantly more important than other functions are reported as 'primary function'. All forest areas with a designated function (not necessarily primary) are reported under 'total area with function'.

As mentioned previously, it is important to stress that the concept of 'protective function' goes beyond the protected area definition, because forests and other wooded land can have a protective function although outside protected areas.

Information availability

Of 229 country reports, 172 contained information on designated primary functions of forests, together accounting for 95 percent of the world's forest area (Figure 6.2). Of these, only 134 reported that they had areas specifically designated for protective purposes, while several countries reported that they had insufficient information on this specific category or they included such areas as part of the category 'multiple purpose'.

FIGURE 6.2
Information availability – area of forest designated primarily for protection



In 2005 a total of 85 countries, representing 46.6 percent of the world's forest area, reported data on total area of forests with a function of protection (not necessarily primary) (Figure 6.3). Some countries, for example Japan, stated that all forests are expected to perform multiple functions. Such countries may not have designated any land as having a primary function of protection: the entire forest area is expected to have protective, productive and possibly other functions.

Results show an improvement in the overall reporting of countries over the past 15 years. There is a clear prevalence of Asian countries among those reporting data for all three years, followed by European countries.

Status

The total extent of forests with protection as their primary function (Table 6.2) was estimated in 2005 at 348 million hectares, equivalent to 9 percent of total forest area. Asia has the highest proportion of forests with a primary function of protection (24 percent), followed by South America (11 percent) and Europe (9 percent). The figures for Western and Central Africa are quite low. This may be due to the fact that only a few countries in this subregion have reported on the protective function of forests.

The relatively small proportion of forests with protection as the primary function reported in North and Central America (0.5 percent) is due to lack of information on protection as a primary function from Canada and the United States, which have included those areas in the multiple purpose category, identifying that as the primary function. This affects the overall analysis, given the large forest area in these two countries. A similar explanation is provided for the very low figure for Oceania: Australia does not have a classification system that can directly report on the designated function classes used by FRA, and so has included areas with protective functions in the multiple purpose category.

It is also useful to consider the reporting of data on the total area of forest for which a specific function of protection has been designated, regardless of whether it is primary or not. Globally, a total forest area of 1 190 million hectares was identified as having a

FIGURE 6.3
Information availability – total area of forest designated for protection

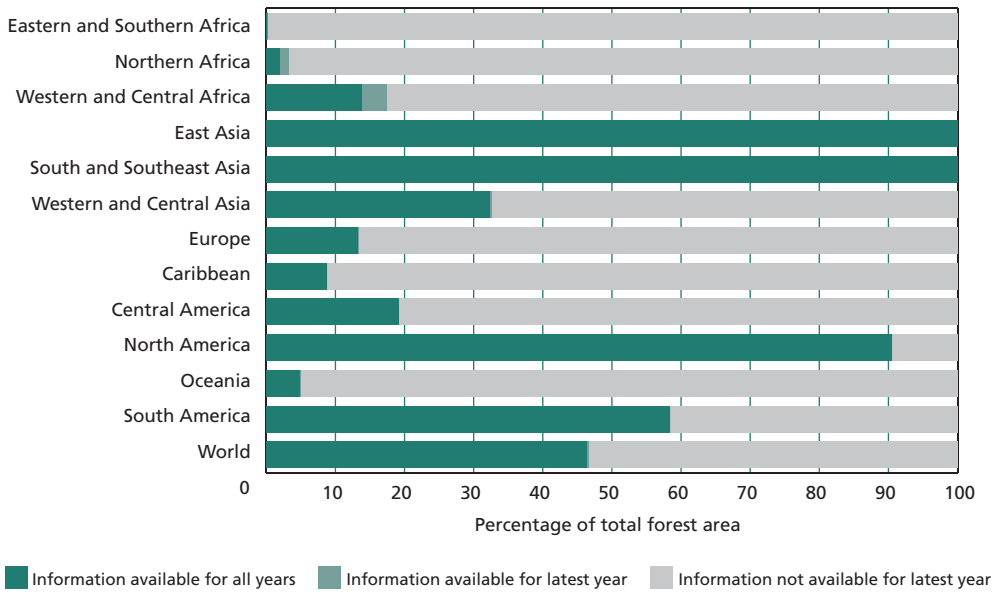


TABLE 6.2
Area of forest designated primarily for protection 2005

Region/subregion	Information availability			Area of forest designated primarily for protection	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	16	211 181	93.2	6 018	2.8
Northern Africa	13	125 667	95.9	12 567	10.0
Western and Central Africa	15	118 280	42.6	2 206	1.9
Total Africa	**44**	**455 129**	**71.6**	**20 791**	**4.6**
East Asia	5	244 862	100.0	66 992	27.4
South and Southeast Asia	17	283 126	100.0	59 097	20.9
Western and Central Asia	23	43 579	100.0	13 069	30.0
Total Asia	**45**	**571 567**	**100.0**	**139 158**	**24.3**
Total Europe	**36**	**991 192**	**99.0**	**90 488**	**9.1**
Caribbean	9	3 489	58.4	1 291	37.0
Central America	7	22 411	100.0	1 068	4.8
North America	4	677 464	100.0	986	0.1
Total North and Central America	**20**	**703 364**	**99.6**	**3 345**	**0.5**
Total Oceania	**14**	**203 467**	**98.6**	**502**	**0.2**
Total South America	**13**	**831 540**	**100.0**	**93 559**	**11.3**
World	**172**	**3 756 260**	**95.0**	**347 842**	**9.3**

protective function in 2005 (Table 6.3). North America has the highest proportion of forests with a protective function, followed by Oceania and Asia.

Twenty-five countries reported that all their forests had protection as one of the designated functions. These countries are Afghanistan, American Samoa, Austria, Bahrain, Belarus, Canada, the Democratic People's Republic of Korea, Egypt, Georgia, Guadeloupe, India, Japan, Kuwait, Kyrgyzstan, Libyan Arab Jamahiriya, New Zealand, Quatar, Singapore, Tunisia, Ukraine, United Arab Emirates, United States of America, Uzbekistan, Viet Nam and Wallis and Futuna Islands.

TABLE 6.3
Total area of forest designated for protection 2005

Region/subregion	Information availability			Total area of forest designated for protection	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	2	77	n.s.	30	39.0
Northern Africa	5	4 160	3.2	2 490	59.9
Western and Central Africa	5	48 595	17.5	1 516	3.1
Total Africa	**12**	**52 831**	**8.3**	**4 036**	**7.6**
East Asia	5	244 862	100.0	227 343	92.8
South and Southeast Asia	17	283 126	100.0	183 714	64.9
Western and Central Asia	13	14 176	32.6	13 600	95.9
Total Asia	**35**	**542 164**	**94.9**	**424 656**	**78.3**
Total Europe	**22**	**133 854**	**13.4**	**50 371**	**37.6**
Caribbean	3	524	8.8	200	38.2
Central America	1	4 294	19.2	3 133	73.0
North America	3	613 226	90.5	613 225	100.0
Total North and Central America	**7**	**618 044**	**87.6**	**616 558**	**99.8**
Total Oceania	**7**	**10 235**	**5.0**	**8 907**	**87.0**
Total South America	**2**	**485 761**	**58.4**	**85 204**	**17.5**
World	**85**	**1 842 890**	**46.6**	**1 189 732**	**64.6**

TABLE 6.4
Trends in area of forest designated primarily for protection 1990–2005

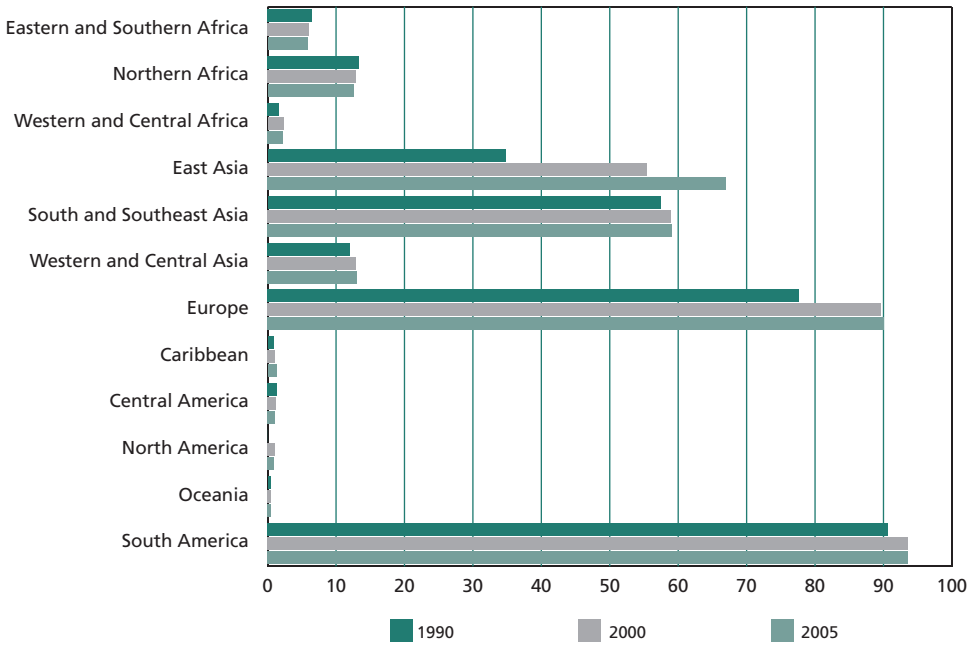
Region/subregion	Information availability (all 3 years)			Area of forest designated primarily for protection *(1 000 ha)*		
	Countries reporting	Forest area *(1 000)*	% of total forest area	1990	2000	2005
Eastern and Southern Africa	15	198 343	87.6	6 440	6 102	5 840
Northern Africa	13	125 667	95.9	13 323	12 866	12 567
Western and Central Africa	15	118 280	42.6	1 630	2 320	2 206
Total Africa	**43**	**442 291**	**69.6**	**21 392**	**21 287**	**20 613**
East Asia	5	244 862	100.0	34 763	55 424	66 992
South and Southeast Asia	17	283 126	100.0	57 422	58 907	59 097
Western and Central Asia	21	43 272	99.3	12 079	12 933	13 047
Total Asia	**43**	**571 259**	**99.9**	**104 264**	**127 263**	**139 136**
Total Europe	**34**	**984 468**	**98.3**	**77 705**	**89 599**	**90 098**
Caribbean	9	3 489	58.4	850	1 085	1 291
Central America	7	22 411	100.0	1 344	1 178	1 068
North America	4	677 464	100.0	0	1 047	986
Total North and Central America	**20**	**703 364**	**99.6**	**2 194**	**3 310**	**3 345**
Total Oceania	**11**	**39 593**	**19.2**	**413**	**450**	**467**
Total South America	**12**	**816 436**	**98.2**	**90 631**	**93 632**	**93 559**
World	**163**	**3 557 412**	**90.0**	**296 598**	**335 541**	**347 217**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in Table 6.2.

Trends

The results of the trend analysis, based on those countries that provided information for all three reporting years (1990, 2000 and 2005), show an overall increase in the area of forests with protection as their primary function, from 8 percent in 1990 to 9 percent in 2005 (Table 6.4 and Figure 6.4). Similarly, there has been an increase in the proportion of the world's forests with protection as one of the designated functions (not necessarily the primary one) from 61 percent in 1990 to 65 percent in 2005 – or an increase of 58 million hectares in the 80 reporting countries providing information for all years.

FIGURE 6.4
Area of forest designated primarily for protection 1990–2005
(million ha)



PROTECTIVE FOREST PLANTATIONS

Recognizing the important protective role of forests, many countries have planted substantial areas of forests and trees for this purpose. These range from large-scale forest plantations to stabilize sand dunes and combat desertification to windbreaks and individual trees planted to provide shade.

For FRA 2005, countries were asked to characterize their forests in five classes: primary, modified natural, semi-natural, protective plantation and productive plantation. While the previous section focused on the total area of forests with a protective function, including both naturally regenerated and planted forests, this section focuses on forest plantations having a primary objective of protection – i.e. the fourth class.

Protective forest plantations are defined as those with introduced species and in some cases native species, established through planting or seeding, with few species, even spacing and/or even-aged stands, predominantly for the provision of services such as protection of soil and water, rehabilitation of degraded lands, combating desertification, etc.

Some countries had difficulty in differentiating whether the purpose of a forest plantation was predominantly productive or protective because of forest plantation management policies for multipurpose or multiple functionality. Protective forest plantations do not totally preclude some harvesting of wood, fibre and other products.

It should be noted that this category only captures a subset of all the forests and trees planted for protective purposes. It does not include, for instance, the planted component of semi-natural forests (sown or planted native species), windbreaks with a width of less than 20 m or an area of less than 0.5 ha or individual trees or groups of trees. A thematic study on planted forests, to be released during 2006, complements FRA 2005 with more detailed data and analysis (see Chapter 2, Box 2.1).

Information availability

Of the 174 countries that provided information on the characteristics of their forests, 93 reported protective plantation data for 1990, 103 for 2000 and 101 for 2005. The

remaining countries reported that they had no protective forest plantations or were unable to distinguish between productive and protective plantations.

As can be seen in Figure 6.5, data availability is generally good, with all subregions except Western and Central Africa and the Caribbean providing information for more than 85 percent of the total forest area in the respective subregions.

Status

The global area of protective forest plantations reported in 2005 was 30.1 million hectares (Table 6.5). A few countries dominated their respective regions, including the Russian

FIGURE 6.5
Information availability – area of protective forest plantations

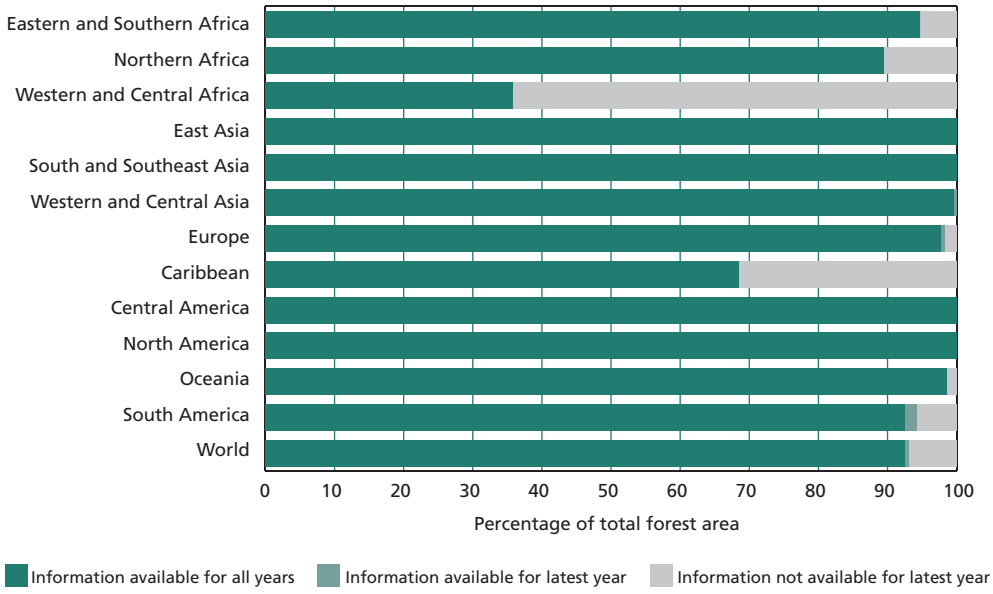


TABLE 6.5
Area of protective forest plantations 2005

Region/subregion	Information availability			Area of protective forest plantations	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	18	214 589	94.7	66	0.03
Northern Africa	12	117 193	89.4	2 192	1.87
Western and Central Africa	17	99 566	35.8	112	0.11
Total Africa	**47**	**431 347**	**67.9**	**2 370**	**0.55**
East Asia	5	244 862	100.0	13 160	5.37
South and Southeast Asia	17	283 126	100.0	4 809	1.70
Western and Central Asia	23	43 579	100.0	2 505	5.74
Total Asia	**45**	**571 567**	**100.0**	**20 474**	**3.58**
Total Europe	**36**	**983 907**	**98.3**	**6 027**	**0.61**
Caribbean	12	4 090	68.5	170	4.16
Central America	7	22 411	100.0	34	0.15
North America	4	677 464	100.0	986	0.15
Total North and Central America	**23**	**703 965**	**99.7**	**1 190**	**0.17**
Total Oceania	**11**	**203 455**	**98.6**	**32**	**0.02**
Total South America	**12**	**783 827**	**94.3**	**31**	**n.s.**
World	**174**	**3 678 069**	**93.1**	**30 125**	**0.82**

Federation, which accounted for 84 percent of all protective forest plantations in Europe; Japan, with 50 percent in Asia; Mexico, with 83 percent in North and Central America; and Algeria and the Sudan, accounting respectively for 31 and 29 percent in Africa. The ten countries with the largest area of protective forest plantations (Figure 6.6) accounted for 25.7 million hectares or 85 percent of the global protective forest plantation area.

Trends

Trends were reported for those countries that provided data sets for all three reporting years.

On a global basis, the protective forest plantation area increased by 405 000 ha per year during 1990–2000 and 330 000 ha per year during 2000–2005. The proportion of protective forest plantations increased from 0.63 percent of total forest area in 1990, through 0.75 percent in 2000, to 0.82 percent in 2005. However, regions and subregions reported changes that differed significantly (Table 6.6).

FIGURE 6.6
Ten countries with largest area of protective forest plantations 2005
(%)

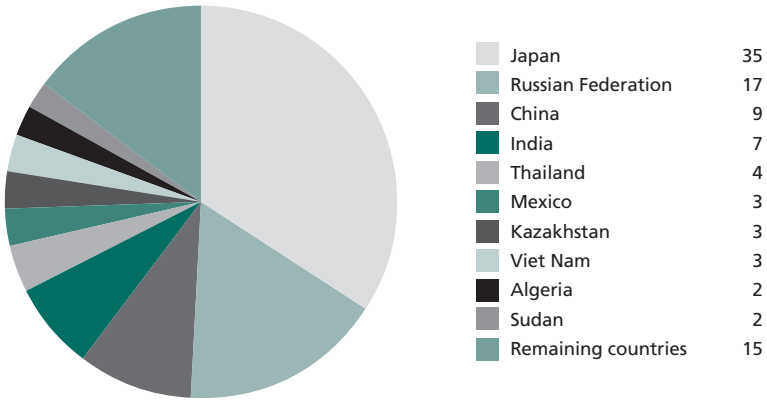


TABLE 6.6
Trends in area of protective forest plantations 1990–2005

Region/subregion	Information availability (all 3 years)			Area of protective forest plantations *(1 000 ha)*		
	Countries reporting	Forest area *(1 000)*	% of total forest area	1990	2000	2005
Eastern and Southern Africa	18	214 589	94.7	66	66	66
Northern Africa	12	117 193	89.4	1 840	2 021	2 192
Western and Central Africa	16	99 414	35.8	70	87	112
Total Africa	**46**	**431 195**	**67.9**	**1 975**	**2 173**	**2 370**
East Asia	5	244 862	100.0	11 622	12 490	13 160
South and Southeast Asia	17	283 126	100.0	3 869	4 451	4 809
Western and Central Asia	22	43 443	99.7	2 175	2 518	2 505
Total Asia	**44**	**571 430**	**100.0**	**17 666**	**19 459**	**20 474**
Total Europe	**34**	**978 682**	**97.7**	**4 569**	**5 574**	**6 027**
Caribbean	12	4 090	68.5	155	151	170
Central America	7	22 411	100.0	32	29	34
North America	4	677 464	100.0	-	1 047	986
Total North and Central America	**23**	**703 965**	**99.7**	**187**	**1 227**	**1 190**
Total Oceania	**10**	**203 284**	**98.6**	**1**	**3**	**21**
Total South America	**11**	**768 723**	**92.4**	**10**	**27**	**31**
World	**168**	**3 657 281**	**92.5**	**24 408**	**28 464**	**30 114**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in Table 6.5.

TABLE 6.7
Ten countries with largest area of protective forest plantations 1990–2005

Country/area	Area of protective forest plantations *(1 000 ha)*			Annual change *(1 000 ha)*		Annual change rate *(%)*	
	1990	2000	2005	1990–2000	2000–2005	1990–2000	2000–2005
Japan	10 287	10 331	10 321	4.4	-2.0	n.s.	n.s.
Russian Federation	3 407	4 648	5 075	124.1	85.4	3.2	1.8
China	1 335	2 159	2 839	82.4	136.0	4.9	5.6
India	1 317	1 890	2 173	57.3	56.6	3.7	2.8
Thailand	661	1 081	1 102	42.0	4.2	5.0	0.4
Mexico		1 047	986		-12.2		-1.2
Kazakhstan	1 034	1 056	909	2.2	-29.4	0.2	-3.0
Viet Nam	303	666	903	36.3	47.4	8.2	6.3
Algeria	614	644	742	3.0	19.6	0.5	2.9
Sudan	764	705	675	-5.9	-5.9	-0.8	-0.8
Total Top 10[1]	**19 722**	**24 227**	**25 725**	**345.8**	**299.7**	**2.1**	**1.2**

[1] Does not include Mexico under area for 1990 and under annual change and annual change rate for the period 1990–2000.

The top ten countries reported markedly varied trends in protective forest plantation area for 1990–2000 and 2000–2005 (Table 6.7). Overall, the protective forest plantation area in these countries increased by 346 000 ha per year[1] for 1990 and by 300 000 ha per year during 2000–2005. However, it did not increase to the same extent for all countries.

Some countries also had difficulty in reporting the proportion of protective forest plantations as a percentage of total forest plantation area, so trends can also reflect reclassification of existing areas (e.g. Japan), rather than an increase in new protective forest plantations.

[1] Excluding Mexico, which did not report for 1990.

Chapter 7

Socio-economic functions

OVERVIEW

Forests provide a wide range of economic and social benefits to humankind. These include contributions to the overall economy – for example through employment, processing and trade of forest products and energy – and investments in the forest sector. They also include the hosting and protection of sites and landscapes of high cultural, spiritual or recreational value. Maintaining and enhancing these functions is an integral part of sustainable forest management.

Information on the status of and trends in socio-economic benefits is thus essential in evaluating progress towards sustainable forest management, together with the more usual statistics on the predominantly environmental values considered under the other themes.

Economic benefits are usually measured in monetary terms and may include: income from employment in the sector; the value of the production of goods and services from forests; and the contribution of the sector to the national economy, energy supplies and international trade. In addition, the economic viability or sustainability of the sector can be assessed by measures such as the profitability of forest enterprises or the level of investment.

The social functions of forests are often more difficult to measure and can vary considerably among countries, depending on their level of development and traditions. For example, in developed, post-industrial societies, the benefits of forests for recreation and amenity values or the maintenance of a rural way of life may be most important, while in developing countries, the area of forests available for subsistence activities or the number of people employed in the sector may be a better indication of their social value. Given the difficulties of measuring the social benefits of forests, social functions are often measured in terms of inputs rather than outputs (e.g. the area or proportion of forests used to provide various social functions).

All the international processes on criteria and indicators include a section on the monitoring and assessment of socio-economic functions or benefits of the forestry sector. A wide variety of variables may be measured: production and consumption; recreation and tourism; funding and investment in the forest sector; cultural, social and spiritual needs and values; forestry employment; health and safety; and community needs.

In FRA 2005, countries provided information on four measures of socio-economic functions:

- Value of wood and non-wood forest product removals. FRA 2005 examines the production of primary products, excluding the benefits of downstream processing.
- Employment in forestry. Figures refer to employment in forestry activities rather than employment in the whole forestry sector (i.e. they exclude employment in processing of wood and non-wood forest products) and they only include formal employment. Countries were asked to provide information for 1990 and 2000 only. No forecasting to 2005 was done.
- Ownership of forest and other wooded land. Three classes of ownership were used: public, private and other. Countries were asked to provide information for 1990 and 2000 only. No forecasting to 2005 was done.
- Areas of forest designated for social services. Two measures were included: area of forest for which the provision of social services was designated as the primary

function and total area of forest for which recreation, education and other social services were designated as one of the functions.

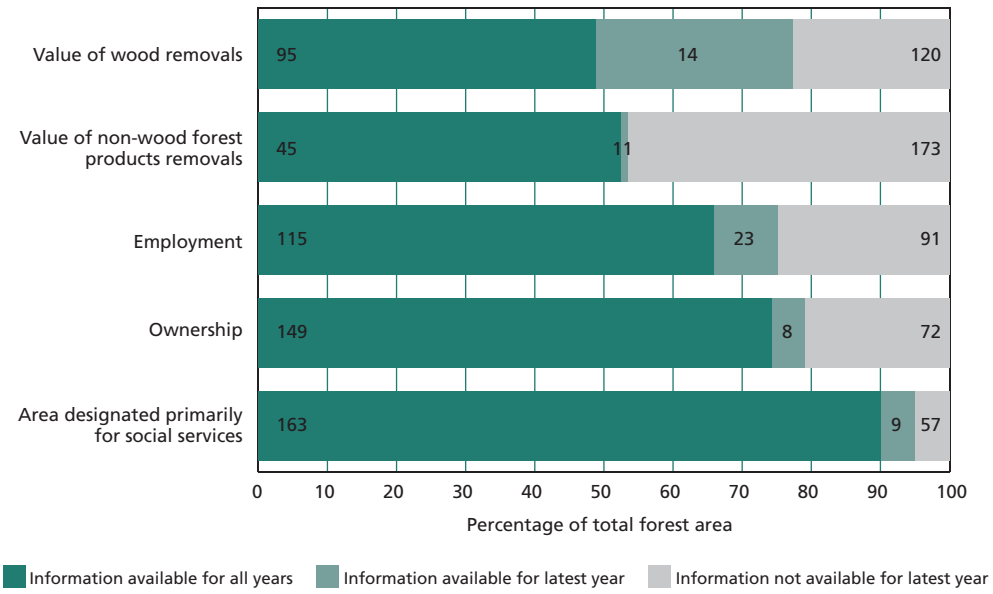
In general, the measures presented in FRA 2005 are more restrictive than those proposed in some international criteria and indicators processes because they refer to benefits from forests only (rather than benefits from the whole forestry sector, which include downstream processing). No information was requested from countries on socio-economic indicators related to health and safety, funding, investment, recycling and contribution to energy supplies, owing to a lack of information on these aspects in many countries.

In general, the availability of information was highest for the area of forest designated for different functions and ownership of forests and lowest for the value of NWFP removals (Figure 7.1). In addition, the quality of information reported on the value of outputs (removals of wood and non-wood forest products) was quite weak in several respects (e.g. incompatible definitions and measurement units, partial responses from some countries, and statistics that contradict other sources or seem otherwise implausible).

KEY FINDINGS

The reported value of roundwood removals in 2005 was about US$64 billion, with the major part of this (US$57 billion) coming from removals of industrial roundwood. The reported trend shows an increase of about 11 percent over the last 15 years, which is less than the rate of inflation over this period. Thus the reported value of removals in real terms has fallen at the global level. At the regional level, North and Central America accounted for about one-third of the total reported value, followed by Europe and Asia with about one-quarter each. Most regions show an increasing trend in the value of removals, with the exception of South America and, in particular, Asia. In part, these exceptions may be attributed to a shift in the structure of wood supply from harvesting of high-value wood in natural forests to an increase in the supply of lower-value wood from forest plantations.

FIGURE 7.1
Information availability – socio-economic functions



Note: Figures present number of countries in each category.

The reported value of NWFP removals amounted to about US$4.7 billion in 2005. Of this, plant products accounted for about three-quarters of the reported total, or just under US$3 billion, with a reported value of US$1.3 billion for food and US$0.5 billion for other plant products. The most significant animal product was bushmeat, with a reported value of US$0.6 billion. Asia and Europe accounted for almost all the total value reported by countries, and the trends at global and regional levels generally showed a slight increase from 1990 to 2000. However, the above figures must all be treated with great caution, as the availability and quality of this information appear to be quite weak and the reported statistics probably cover only a small fraction of the true total value of NWFP removals.

Countries reported that some 10 million people are employed in forestry. This is a decline of 10 percent compared with the employment figure for 1990. Most of the decline has occurred in the production of goods and can probably be attributed to increases in labour productivity. The figures for both periods may include some employment in informal activities. Although FRA 2005 does not include data on informal employment or employment in the wood processing industry, it was difficult for some countries to separate these. Thus, the actual figure for formal employment is probably somewhat less than 10 million. However, if the informal sector were to be intentionally included, the importance of the forestry sector – for rural livelihoods, for example – would be much higher than reported here.

With respect to ownership of forests and other wooded land, the area of private ownership is increasing, but the majority of the world's forests remain under public ownership (84 percent of forest and 90 percent of other wooded land). There are considerable differences among regions, however, with some having a significantly higher proportion of private ownership than others (e.g. North and Central America, Oceania and South America).

At the global level, almost 4 percent of forests are managed primarily for recreation, education, tourism and other social services. However, information availability is a problem in many regions. Europe seems to give the most attention to the social services provided by forest resources through active designation of areas for this purpose.

In general, the economic contribution of forests is declining (e.g. the reported declines in employment and in the real value of outputs from the sector), although the social contribution of forests may be increasing slightly in some regions (e.g. Europe). However, this does not necessarily indicate that the value of this contribution has fallen. Lower employment reflects increases in labour productivity, and the decline in the value of output is the result of lower product prices. Both of these changes suggest that the sector is becoming more efficient, which benefits the downstream processing sector and consumers. Thus the declining contribution can be viewed as an indicator of success.

VALUE OF WOOD REMOVALS

The combined value of removals of wood and non-wood forest products is an indicator of the contribution of forests and woodlands to national economies. This information is used to develop and monitor national policies, set priorities and allocate resources.

The present analysis examines the value of wood removals from forests only (i.e. it excludes other wooded land). It does, however, include the data from eight countries that provided information for forests and other wooded land combined (Algeria, Austria, Burkina Faso, Canada, Jamaica, Jordan, Namibia and Niger). Industrial roundwood and fuelwood were reported separately for FRA 2005 and are analysed separately here.

Information availability

At the global level, 109 countries, or some 42–47 percent of countries, depending on the year, reported on the value of industrial roundwood removals, with most reporting for the year 2000. Similarly, 37–41 percent of countries reported on the value of fuelwood

removals, also with most reporting for 2000. The countries reporting on either or both of these figures for 2005 account for almost 80 percent of the global forest area, although countries reporting for all three years account for only half of the area (Figure 7.2).

At the regional level, a higher proportion of countries in Asia, Europe and South America provided information. In Africa, only about one-third of the countries did so, but almost all of these provided information on the value of both fuelwood and industrial roundwood removals. In addition, most of the larger countries in Africa reported. Similarly, despite the relatively low number of responses from Oceania and North and Central America, most of the countries with significant forest areas in these two regions provided some information (e.g. Australia, Canada [1990 and 2000 only], Mexico, New Zealand, Papua New Guinea and the United States).

Another indicator of the availability of information is given in Table 7.1. This shows the proportion of total global and regional production covered by the countries

FIGURE 7.2
Information availability – value of wood removals

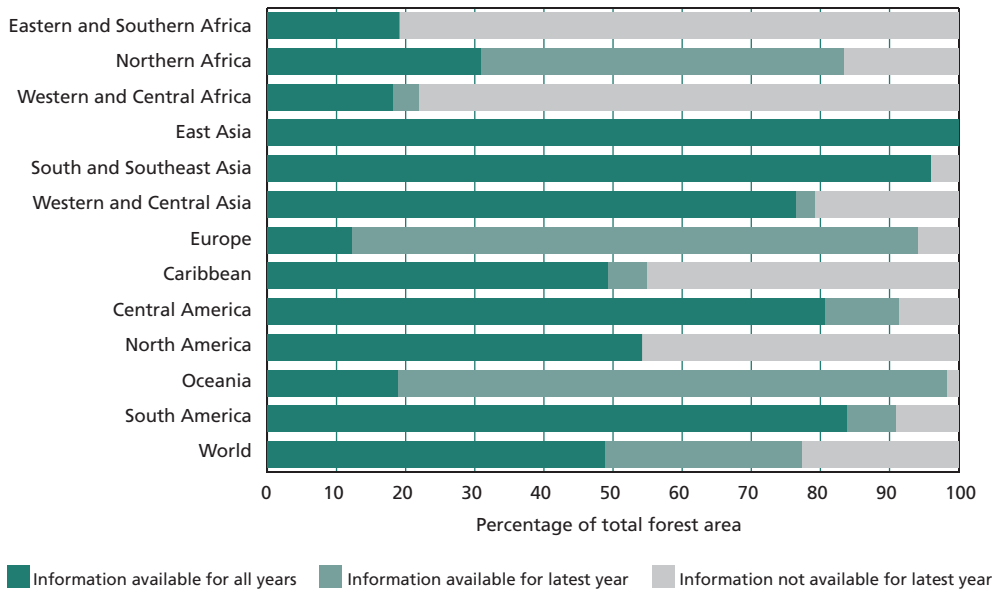


TABLE 7.1
Proportion of roundwood production in value of wood removals 2005

Region	Industrial roundwood production in 2004 *(million m³)*			Fuelwood production in 2004 *(million m³)*		
	Total for region	Total for countries reporting value in 2005	Proportion of total production in countries reporting values *(%)*	Total for region	Total for countries reporting value in 2005	Proportion of total production in countries reporting values *(%)*
Africa	71	45	64	551	298	54
Asia	220	219	100	777	487	63
Europe	508	392	77	117	86	74
North and Central America	624	426	68	130	110	85
Oceania	51	50	99	9	0	0
South America	149	146	98	194	172	89
World	**1 623**	**1 279**	**79**	**1 777**	**1 153**	**65**

Source: based on FAOSTAT (FAO, 2005a) and national reports.

providing value statistics for 2005 (FAO, 2005a). As this table shows, the countries providing information on the value of industrial roundwood removals accounted for almost 80 percent of global industrial roundwood production and 65 percent of fuelwood production.[1]

Status

Globally, the total reported value of wood removals in 2005 was US$64 billion, with some US$57 billion from industrial roundwood and a further US$7 billion from fuelwood (Table 7.2). Although the volume of global fuelwood production is about the same as the production of industrial roundwood, these figures suggest that the value of fuelwood production per cubic metre is roughly one-tenth that of industrial roundwood production, which seems plausible.

At the regional level, North and Central America accounted for about one-third the total reported value of removals (and it should be noted that Canada is not included in this figure). Asia and Europe come next, each accounting for about one-quarter of the total, followed by Africa, Oceania and South America.

The reported value of industrial roundwood removals across the regions follows a similar pattern. For fuelwood, however, Asia and Africa accounted for more than half the total reported value of removals – owing to the great number of people that use fuelwood in these regions (combined with the high population level in Asia). It is also worth noting that the reported value of fuelwood removals in Africa amounted to about 40 percent of the reported value of all removals, whereas in other regions, the reported value of fuelwood removals amounted to about 20 percent or less of the total.

The availability of information about the value of wood removals is quite good, as the countries providing this information account for a significant proportion of total global production. However, it should be noted that some significant countries reported the value of only a part of their total production (e.g. the figures for fuelwood removals in India and Indonesia were very low).

Trends

For comparability, Table 7.3 includes only information from countries that reported value information for all three years. As a result, values for 2005 may be lower than those shown in Table 7.2 (which includes all reporting countries). In addition, Table 7.3 does not include values for some significant countries that did not report any figures or reported for only one or two years (e.g. Canada, which reported for 1990 and 2000 only).

Globally, the reported trend in the value of wood removals shows a slight increase, from US$53 billion in 1990 to US$55 billion in 2000 and US$59 billion in 2005. Most of this is due to a reported increase in the value of industrial roundwood removals, as the reported value of fuelwood removals has not changed significantly.

The above figures amount to an 11 percent increase over the last 15 years. However, these figures have not been adjusted for inflation. After adjusting, the reported value of wood removals has certainly fallen at the global level during this period.

At the regional level, the reported trend in the value of wood removals shows an increase in all regions except Asia and South America. In particular, the reported trend in Asia shows a significant decline, reflecting the declines reported in some major countries (e.g. Indonesia, Japan and Malaysia). In part, this can be attributed to lower levels of removals in these countries over the period.

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[1] However, some countries reported the value of removals for only a portion of their total production. This was particularly a problem for fuelwood removals (e.g. in India and Indonesia). Thus the proportion of global production actually covered by the value statistics is somewhat less than implied.

TABLE 7.2
Value of wood removals 2005

Region	Value (million US$)		
	Industrial roundwood removals	Fuelwood removals	Industrial roundwood plus fuelwood removals
Africa	2 748	1 845	4 594
Asia	14 366	2 120	16 486
Europe	13 858	1 159	15 016
North and Central America	19 659	579	20 238
Oceania	1 839	n.s.	1 839
South America	4 281	1 347	5 628
World	**56 750**	**7 050**	**63 800**

TABLE 7.3
Trends in value of wood removals 1990–2005

Region	Value (million US$)		
	1990	2000	2005
Industrial roundwood removals			
Africa	999	1 826	2 361
Asia	20 375	15 806	14 365
Europe	9 977	8 800	11 832
North and Central America	10 313	19 090	19 536
Oceania	276	577	660
South America	4 697	3 355	4 232
World	**46 638**	**49 455**	**52 986**
Fuelwood removals			
Africa	968	1 206	1 369
Asia	2 010	1 843	2 118
Europe	638	633	970
North and Central America	554	560	579
Oceania	n.s.	n.s.	n.s.
South America	2 022	934	1 347
World	**6 193**	**5 176**	**6 383**
Industrial roundwood plus fuelwood removals			
Africa	1 967	3 032	3 729
Asia	23 268	18 411	16 483
Europe	10 616	9 433	12 802
North and Central America	10 867	19 650	20 116
Oceania	276	577	660
South America	6 719	4 289	5 579
World	**53 714**	**55 391**	**59 369**

In South America, the reported value of wood removals declined significantly from 1990 to 2000, but has since partly recovered – largely due to changes in Brazil, where the reported value of wood removals has followed a similar pattern. The level of industrial roundwood removals in that country has increased throughout the period, but the value has fallen and then risen again. This has been caused by a shift in the structure of production in Brazil over the last 15 years – from the production of industrial roundwood from natural forests (bringing a high price) to that from forest plantations (bringing a much lower price, but eventually greater production). A structural change such as this could also partly account for the trend in Asia.

The reported value of wood removals in Europe has increased slightly, showing a slight drop from 1990 to 2000 and then an increase. These changes probably reflect market liberalization in the formerly centrally planned economies of eastern Europe. A significant fall in production levels occurred in the early 1990s in Europe, followed by rapid growth in the latter part of the decade. The figures shown above do not capture all the profound changes that have occurred in Europe over the last 15 years (UNECE, 2005), but they do indicate that the value of removals is now higher than at the start of these changes.

In the other three regions (Africa, North and Central America and Oceania), the reported value of wood removals has roughly doubled. In Africa and Oceania this is due, to some extent, to increases in the level of removals. In addition, in all three regions, it seems likely that this has been supported by an increase in unit prices over the period. In contrast to the other regions, it is also likely that the reported value of removals has increased in real terms (i.e. after adjusting for inflation).

In terms of the substance of these figures, the most interesting feature is the trend in the reported value of wood removals shown in Brazil, as production shifted from natural forests to forest plantations. Given the current and projected trends in wood supply, it can be expected that more countries will display such a trend in the future.

This trend also highlights a final problem with these figures: they are an indication of the gross rather than the net value of output (or value-added). A decline in the value of removals (as shown in Brazil) may not necessarily indicate that the economic sustainability of forestry has declined. Rather, it could indicate that the sector has become more cost-efficient. In such cases, it is quite possible that gross value is declining while value-added (and hence economic viability) is increasing. In the future, it would be useful to include statistics for value-added for the whole sector, including processing, rather than only for the value of removals. These statistics would give a better indication of economic sustainability. They are found in national income accounts and can often be obtained relatively easily (Lebedys, 2004).

VALUE OF NWFP REMOVALS

The value of NWFP removals, like that of wood removals, is an indicator of the contribution of forests and woodlands to national economies. It also indicates the contribution of the sector to poverty alleviation, as these products are mostly collected by relatively poor people living in rural areas.

Information availability

Fifty-six countries provided information, accounting for slightly more than half the global forest area (Figures 7.3 and 7.4). In general, more information about value was available for plant products than for animal products. Plant product categories for which availability of information was highest were food, medicinal and aromatic plants, exudates and other plant products. For animal products, information was more available for the value of removals of bushmeat, honey and beeswax. For many products and reporting years, less than 10 percent of the countries provided information.

For almost all products and regions, more information was available for 2000 than for 2005. For example, 18 percent of countries provided information on food in 2000. At the regional level, the proportion of countries providing this information was highest in Asia and Europe. Very little information was available outside these regions.

Although availability of information about the value of NWFP removals appears to be very low, it should be noted that values are likely to be zero (or close to zero) for many of the products in countries not providing this information. On the other hand, figures supplied by countries are also likely to be very low estimates of the total value of their removals. Two main problems of underreporting were identified in country statistics. First, in many cases, countries reported the value of only part of total removals

FIGURE 7.3
Information availability – value of NWFP removals

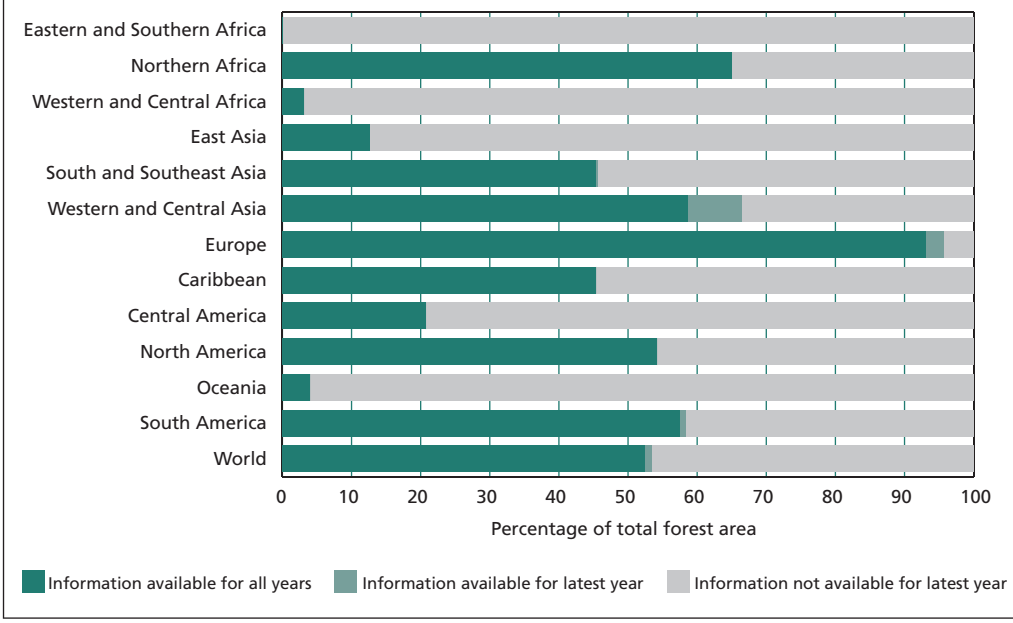
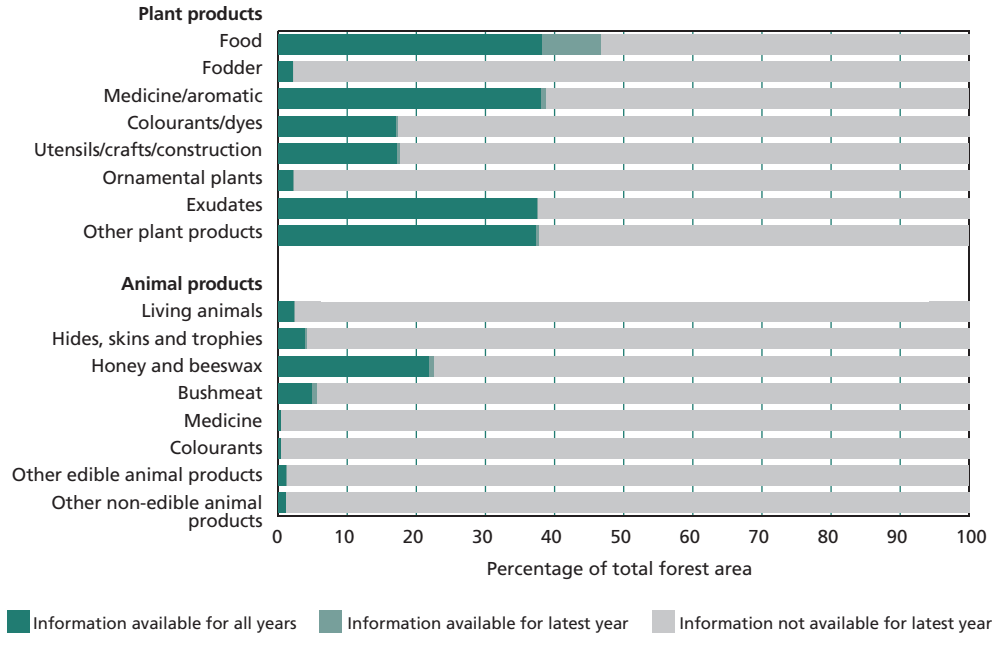


FIGURE 7.4
Information availability – value of NWFP removals by product category



(e.g. only removals for sale, or from state land, or of one of a number of products within a category). Second, the values reported were sometimes the value of exports only or of the income from licence fees to remove products.

Status

In 2005, the total reported value of removals amounted to about US$4.7 billion (Table 7.4). Plant products accounted for about three-quarters (or just under US$3 billion). Among these, food had the highest value (US$1.3 billion), followed by other plant

TABLE 7.4
Value of NWFP removals 2005 *(US$1 000)*

Region	Category of NWFP						Total
	Food	Exudates	Ornamental plants	Other plant products	Bushmeat	Other	
Africa	4 469	42 180	70	16 001	3 064	831 415	897 199
Asia	817 843	316 359	8	279 052	21	317 827	1 731 110
Europe	381 936	801	344 065	139 154	616 721	321 942	1 804 619
North and Central America	34 200	15 267	-	17 988	-	4 240	71 695
Oceania	-	0	0	11 463	181	6 946	18 590
South America	96 386	1 673	-	32 003	4 099	63 069	197 230
World	**1 334 833**	**376 280**	**344 143**	**495 661**	**624 086**	**1 545 439**	**4 720 443**

products (US$0.5 billion). Fruit, berries and nuts were identified as the main food products in most countries. Three specific products and countries accounted for the relatively high value of other plant product removals: bidi leaves in India, cork in Spain and manure in the Republic of Korea. Of the animal products, the reported value of bushmeat removals was by far the most important, with a value of US$0.6 billion.

At the regional level, Asia and Europe accounted for almost 90 percent of the total reported value of removals, with values of US$1.7 billion and US$1.8 billion respectively. In Asia, food was by far the most significant product, with a reported value of US$0.8 billion, followed by exudates and other plant products (US$0.3 billion each). In Europe, the reported value of bushmeat removals was US$0.6 billion, followed by food (US$0.4 billion) and ornamental plants (US$0.3 billion).

The other regions reported minimal values for NWFP removals in 2005, owing to very limited availability of information. For example, the reported value of bushmeat removals outside Europe was only US$5 million, which is likely to be a vast underestimate of the true value of removals in these other regions.[2]

The reported global value of NWFP removals in 2005 (US$4.7 billion) compares with a total value of global international trade in NWFPs of US$11.0 billion in 2004 (derived from United Nations, 2005c, following a methodology outlined in FAO, 2005e). Although the latter figure includes some trade in processed NWFPs, international trade probably accounts for only a tiny proportion of NWFP removals. Thus a comparison of these two figures suggests that the values reported here are a vast underestimate of the total value of NWFP removals.

Trends

Because of the lack of reported trends at the country level (i.e. very few countries provided statistics for all three years), Table 7.5 displays the total value reported for each year. Globally, it appears that the total value of removals increased from 1990 to 2000, then declined from 2000 to 2005. However, this is a function of the smaller number of countries reporting information for 2005 (in particular, China is missing). Thus the following analysis focuses on changes from 1990 to 2000, in which the information is slightly more comparable.

At the global level, the reported value of NWFP removals increased by 26 percent, from US$4.8 billion in 1990 to US$6.1 billion in 2000. The reported value of food removals increased significantly, from US$1.6 billion in 1990 to US$2.6 billion in 2000. The reported value of removals of exudates also almost doubled over the same period to US$0.9 billion in 2000. In contrast, the reported values of removals of the other two

[2] Much of the bushmeat produced in other regions is unregulated and/or illegal, so there are no official statistics and the product is not reported by countries.

most significant NWFPs (bushmeat and other plant products) declined slightly from 1990 to 2000.

At the regional level, the reported value of NWFP removals increased significantly in Asia (from US$2.0 billion in 1990 to US$3.4 billion in 2000) and increased very slightly in Europe (from US$1.5 billion in 1990 to US$1.6 billion in 2000). However, these trends may not be very reliable, given the small proportion of total NWFP removals covered by the information. For the same reason, reliable trends for the other regions cannot be derived from the small number of reported values.

The availability of information is very low for both the amount and the value of NWFP removals. However, given that these removals can have an impact on large numbers of poor people, there is great interest in this type of information (for example, the current interest in the contribution of forests to poverty alleviation and the emphasis on poverty reduction strategies and achievement of the Millennium Development Goals in many developing countries). In view of this, it is recommended that countries continue developing ways to collect, estimate and analyse this information with appropriate support from international partners.

EMPLOYMENT

The level of employment in forestry is an indicator of both the social and economic value of the sector to society. Employment provides income and, as forestry activities occur in rural areas that are often poorer than the average, it gives some indication of the sector's contribution to poverty alleviation. In social terms, the value of employment is in allowing individuals to become productive members of society.

It is important to gather and analyse this information, as it is a significant indicator of the impact of forests on people and demonstrates the contribution of the sector to broader economic aims and objectives. Many, if not all, governments are concerned about the level of employment and this is often a major performance indicator for government policy.

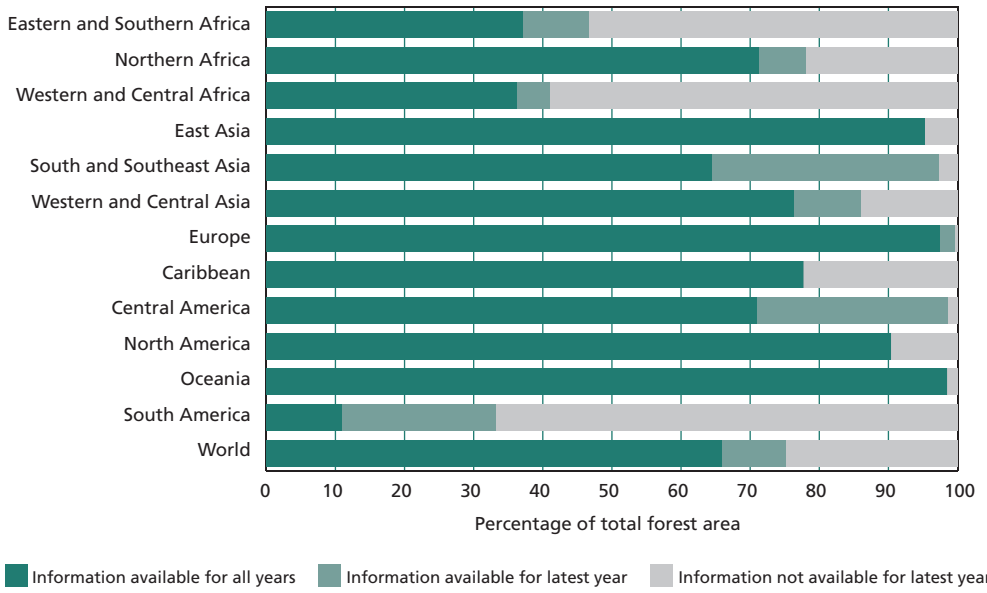
For FRA 2005, employment was defined as: "Any type of work performed or services rendered under a contract of hire, written or oral, in exchange for wage or salary, in cash or in kind", based on definitions by the International Labour Organization and the Employment Security Commission. However, information was requested only on employment related to the primary production of forest goods and related services, i.e. excluding the processing of wood and non-wood forest products. Thus the figures cannot be compared with statistics on employment in the forestry sector as a whole. The International Standard Industrial Classification, generally used by national statistical agencies, is being revised for greater clarity and level of detail for many economic activities (including forestry). It may be useful to review and refine the definition of forestry employment once this has taken place, with a view to increasing comparability between data sources and making full use of existing national employment statistics.

TABLE 7.5
Reported values of total NWFP removals 1990–2005 *(US$1 000)*

Region	1990	2000	2005
Africa	847 233	724 451	897 199
Asia	1 951 852	3 395 433	1 731 110
Europe	1 535 811	1 600 796	1 804 619
North and Central America	48 372	108 074	71 695
Oceania	18 889	42 648	18 590
South America	423 652	234 107	197 230
World	**4 825 808**	**6 105 508**	**4 720 443**

Note: The figures in this table should not be interpreted as illustrating actual trends, since some countries did not report on all product categories for all three reporting years.

FIGURE 7.5
Information availability – employment



Information availability

At the global level, 138 countries reported on employment. Those reporting for all three years account for about 67 percent of global forest area (Figure 7.5).

As a check on the quality of the information, the reported statistics were compared with the statistics on forestry employment reported by national statistical offices (Lebedys, 2004). This detailed examination of the quality of the statistics revealed a number of problems and issues, especially with a few of the significant countries (which affect the global results).

For example, the United States included employment in sawmilling in their employment figures for FRA 2005 (resulting in a much higher number than for employment in roundwood production alone). A similar problem may also have arisen for countries that reported employment in the public forest administration where these administrations also own and manage forest processing facilities. Conversely, the Russian Federation included only employment in the Ministry of Natural Resources (which is likely to be an underestimate of total employment in forestry).[3]

Perhaps the greatest concern identified was that some countries may have reported the number of people employed part time in the sector, without converting these figures to full-time equivalents. The most notable example of this was India, where the national report showed very high levels of employment in the sector (5.6 million and 4.9 million in 1990 and 2000 respectively). This was largely owing to the inclusion of some very high numbers for people employed in the establishment of forest plantations. These employment estimates were based on the number of hectares

[3] More generally, it should be noted that countries took different approaches to the inclusion/exclusion of employment in the public sector in their reported statistics. Some included all public-sector workers, while others apparently didn't include any. The FRA definitions asked countries to include "employment in direct supervision activities by private and/or public entities". However, this could have led to some errors, as it contradicts other standard economic classification systems (e.g. the International Standard Industrial Classification), which classify the government as a separate sector in the economy. It should also be noted that "provision of services" was defined more broadly than in other standard classification systems (e.g. to include ecotourism in forest areas).

planted multiplied by the average number of people employed per hectare. For forest plantation establishment, this factor was reported to be 3.8 persons per hectare. While 3.8 persons per hectare, on average, may have been employed at some time in planting trees, it seems very unlikely that this is a figure for permanent employment in tree planting.

Another possible problem is that some of the reported statistics may include the numbers of people collecting fuelwood and NWFPs for subsistence purposes. The guidelines and definitions (FAO, 2004b) specifically stated that only paid employment should be included in the statistics, but it seems likely that several countries also included employment in subsistence production.

Given the doubts about some of these figures, it is not possible to draw any robust conclusions about the current status and trends in forestry employment on the basis of the global totals for the statistics reported. A focused effort should be made to improve the quality of employment statistics in a few key countries in which the reported statistics are missing, or are very high but may be based on minimal survey data or very simple estimation techniques.

Status

The total reported level of employment in forestry in 2000 is 11.0 million people (Table 7.6), of which over half (6.0 million) are employed in the primary production of goods.

At the regional level, the reported level of employment is highest in Asia (8.3 million), with India accounting for over half of this and China a further one-quarter (2.0 million). Next highest are Africa and Europe, with reported employment of 0.9 million each, followed by North and Central America, with 0.6 million. Reported employment in the provision of services is generally much lower than employment in the primary production of goods, except in Africa and Asia. In Africa, this results from the inclusion of ecotourism employment in South Africa (estimated at 200 000). In Asia, it reflects the inclusion of 2.3 million people reportedly employed in forest plantation establishment and management (see previous comments).

Lebedys (2004) presents a figure of 4.2 million for total forestry employment in 2000. Although that figure includes estimates for a number of countries, it is notable that the statistics reported above amount to more than twice this figure. One country – India – accounts for a significant proportion of this discrepancy (the figure quoted in Lebedys is based on the results of an earlier FAO survey of forestry employment in which India reported a 1994 level of employment of only 263 000). In many other cases, the figures reported here and in that report are quite similar or can be explained by differences in definitions.

TABLE 7.6
Number of people employed in forestry in 2000

Region	Number employed *(1 000 person-years)*			
	Primary production of goods	Provision of services	Unspecified	Total
Africa	465	305	100	870
Asia	4 425	3 008	875	8 308
Europe	412	63	471	946
North and Central America	415	55	135	605
Oceania	28	4	6	37
South America	215	20	9	245
World	**5 960**	**3 455**	**1 596**	**11 011**

Trends

Trends are shown only for countries that reported for both years (Table 7.7). Globally, reported employment in forestry declined slightly from 1990 to 2000, by about 1 million (or 10 percent). At the regional level, Asia and Europe also showed this downward trend, while in the other regions, employment increased somewhat.

The changes in employment can be explained by a number of factors. Most of the decline has occurred in the primary production of goods, which can probably be attributed to increases in labour productivity (e.g. increased mechanization of harvesting operations). In Europe, the decline in employment numbers can also be explained by the restructuring of formerly centrally planned economies. In some countries, this has led to decreased production and employment. More generally, the privatization of forestry activities in eastern Europe has led to large increases in labour productivity in the region and, as a consequence, a decline in employment numbers. The regions showing an increase in employment may reflect roundwood production that is increasing faster than increases in labour productivity (for a more detailed discussion, see Lebedys, 2004).

OWNERSHIP OF FORESTS AND OTHER WOODED LANDS

Understanding the impact of tenure issues on sustainable forest management and recent trends is essential to the formulation of effective policies by governments. Forest ownership is in transition in many countries: ownership and control over natural resources is increasingly shifting from the state to local communities and to individual households (Scherr, White and Kaimowitz, 2003). Current trends in privatization and community involvement in forest management have been accompanied by rapid changes in resource tenure patterns and increasing complexity of stakeholder relations. These changes, in addition to affecting the way in which forests are managed, have social, political and economic implications.

Worldwide – and more specifically in developing countries – most forest areas are under the formal jurisdiction of governments, and forest management is still primarily a state matter. Excessive deforestation and forest degradation have resulted from population pressure, agricultural expansion, escalating demand for wood products, illegal logging, industrial development and rapid economic growth. This has triggered a debate not only on the effectiveness of public-sector forest management, but also on the relevance of overall state ownership.

Over the past 20 years, commitment has been growing to empower local communities, decentralize decision-making to local government units and increase private-sector involvement in forest management. This development is paralleled by

TABLE 7.7
Trends in number of people employed in forestry 1990–2000

Region	Number employed *(1 000 person-years)*							
	1990				2000			
	Primary production of goods	Provision of services	Unspecified	Total	Primary production of goods	Provision of services	Unspecified	Total
Africa	222	23	55	301	292	35	90	417
Asia	5 160	2 953	1 026	9 139	4 261	3 004	875	8 140
Europe	413	70	509	992	335	62	365	762
North and Central America	368	57	42	467	407	55	53	515
Oceania	26	4	4	35	28	4	6	38
South America	44	20	0	64	50	17	0	67
World	**6 233**	**3 128**	**1 637**	**10 998**	**5 372**	**3 178**	**1 389**	**9 939**

significant shifts in forest tenure and innovative institutional arrangements aimed at increasing the direct involvement of stakeholders in forest management.

To capture these trends, for the first time the assessment requested information classifying the world's forests as public, private or other (including non-classified). Analysis of the information reported reveals that more work is needed in defining the ownership- and tenure-related data to be collected and in ensuring that such data will be gathered at the global level. A thematic study on forest ownership and resource tenure will complement the information provided in FRA 2005 (Box 7.1).

BOX 7.1

FRA 2005 thematic study on forest ownership and resource tenure

With a view to assessing and understanding changes in forest ownership patterns, possible variations among continents and issues related to these trends, the FAO Forestry Department has begun a thematic study aimed at complementing the information collected through the FRA 2005 reporting table on forest ownership.

The study, to be released during 2006, was designed to collect, analyse and monitor data on forest ownership, resource tenure and related trends at the regional level in policy and law development.

This phase is a pilot exercise conducted in East and Southeast Asia. Similar studies are expected to be conducted in other regions. Its objective is to develop and test a methodology for collecting and monitoring forest ownership and tenure data at the global level that can be integrated into the FRA 2010 process. The exercise has been implemented on two levels:

Regional. A pilot survey was conducted in 17 countries,[1] aimed at collecting detailed data on forest areas for two variables: different types of ownership and different levels of control of and access to resources. The information was gathered through the use of a matrix designed for this purpose and was completed by country focal points (primarily government agencies).

National. Eleven country-specific case studies were conducted in nine countries[2] with the objective of expanding and strengthening the quantitative analysis done at the regional level and of complementing this with detailed qualitative information on types of forest tenure, particularly on resource ownership, management agreements and institutional arrangements. The case studies seek a better understanding of the relationship between forest resource tenure and forest management – and specifically of the implications for poverty alleviation.

Results and main conclusions

- Forests remain public to a great extent (86 percent), with limited differences among countries, and mostly under the direct control of central governments (79 percent).
- Devolution of management responsibilities to local communities involves no more than 10 percent of forests (18 percent if small-scale forest holders are included). In general, rights are devolved for degraded forests.
- Short-term management agreements prevail over long-term ones.
- Despite the examples provided by some countries – known for their well-established traditions of community forestry, joint forest management and private forestry – the scale of these schemes remains limited. Forests and the forestry sector do not generally offer a more diversified and adapted system of tenurial arrangements than can be seen in the rural development context.
- Some emerging trends are the allocation of forests to private households (China and

Viet Nam) and the interesting, but still limited and very recent granting of long-term agreements (100 years) to private companies (Malaysia).

- The forestry sector seems slow to adapt to current trends such as decentralization and greater stakeholder participation. Instead, it tends to react to shocks in extreme ways (e.g. logging bans), which further weaken tenure rights.
- In many countries, resource users and managers still have only a vague understanding of their roles, responsibilities and rights: poor management is often the result of limited knowledge and capacities.

Evidence emerging from the case studies demonstrates the linkage between clear and secure tenure arrangements and the contribution of forests to sustainable livelihoods and better management. While security of tenure is recognized as a founding block of effective forest management, it is not a sufficient condition. Secure forest tenure needs to be consolidated by effective capacity-building.

A strong recommendation emerging from the study is that awareness must be increased of the implications of forest ownership and tenure on forest management and poverty reduction. It is expected that FRA 2010 could contribute significantly to this goal.

[1] Bangladesh, Bhutan, Brunei, Cambodia, China, India, Indonesia, Japan, Lao People's Democratic Republic, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Republic of Korea, Thailand and Viet Nam.
[2] China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Thailand and Viet Nam.

Information availability

Of the total of 229 countries and territories covered by FRA 2005, 157 (69 percent) have reported on ownership of forests, accounting for 77 percent of total forest area (Figure 7.6). The percentage is slightly lower for ownership of other wooded land.

The highest response rate was for Asia (93 percent) and Europe (84 percent), followed by Africa (62 percent), Oceania (47 percent) and North and Central America (45 percent). The lowest response rate was registered in South America, where only 40 percent of the countries were able to report, with important gaps such as Argentina, Brazil, Colombia and Venezuela.

Uncertainty in tenure-related issues, lack of up-to-date information, rapid changes, and the fact that forest ownership has been inserted only very recently into forest inventories affect the availability of reliable information. In addition, availability of data might be restricted to those countries that possess a rural cadastre, i.e. mainly developed countries. In many cases, owing to rapid evolution of the situations in eastern European countries and China, monitoring of trends is hindered by the difficulty and cost of obtaining current data. Data availability and trends also often vary greatly among regions and provinces in the same country.

Status

Most of the conclusions reported here are limited to forests (Table 7.8). Many countries including Australia and the United States provided data for ownership only of forests and not of other wooded land; therefore it is not possible to merge or compare the two categories. It can generally be said that no major differences in the ownership structure occur between the ownership of forests and other wooded land, at least at subregional and global scales.

Public ownership is by far the predominant category in all regions and subregions (Figure 7.7). At the global level, 84 percent of forests and 90 percent of other wooded land are public. Given that the 'public forest' category in FRA 2005 includes not only

forests owned by central, regional or local public bodies, but also those owned by groups (villages, communities and indigenous groups), it is difficult to draw conclusions about the management of public forests: many different categories are included under the same definition. Thus the most significant information is the percentage of private forests and its trend.

The highest percentage of private forests occurs in Central America (56 percent) and North America (29 percent). In Europe, private forests represent 10 percent. However, excluding the Russian Federation, they reach 51 percent. In Africa, private forests are uncommon.

FIGURE 7.6
Information availability – ownership

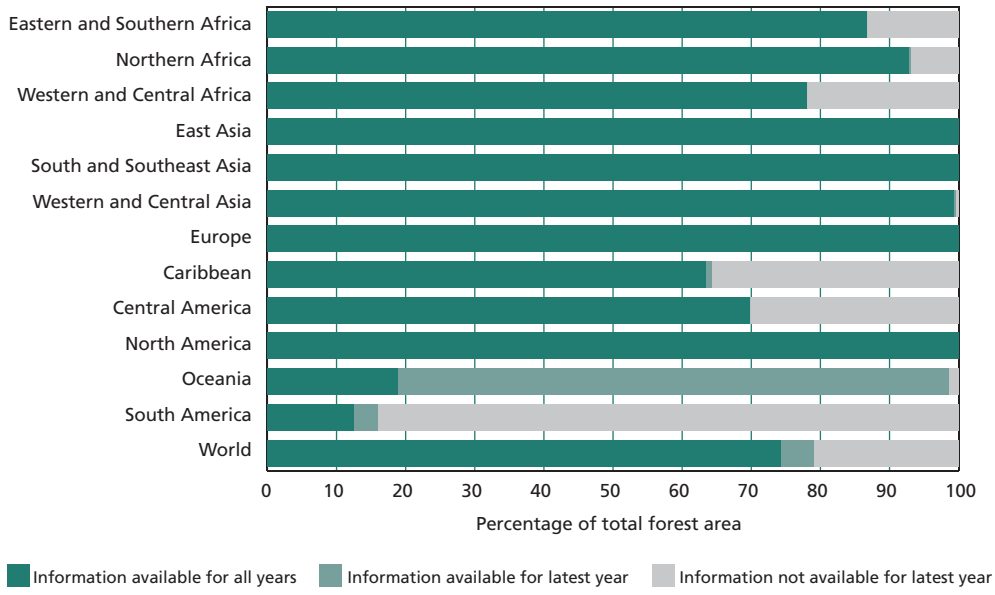
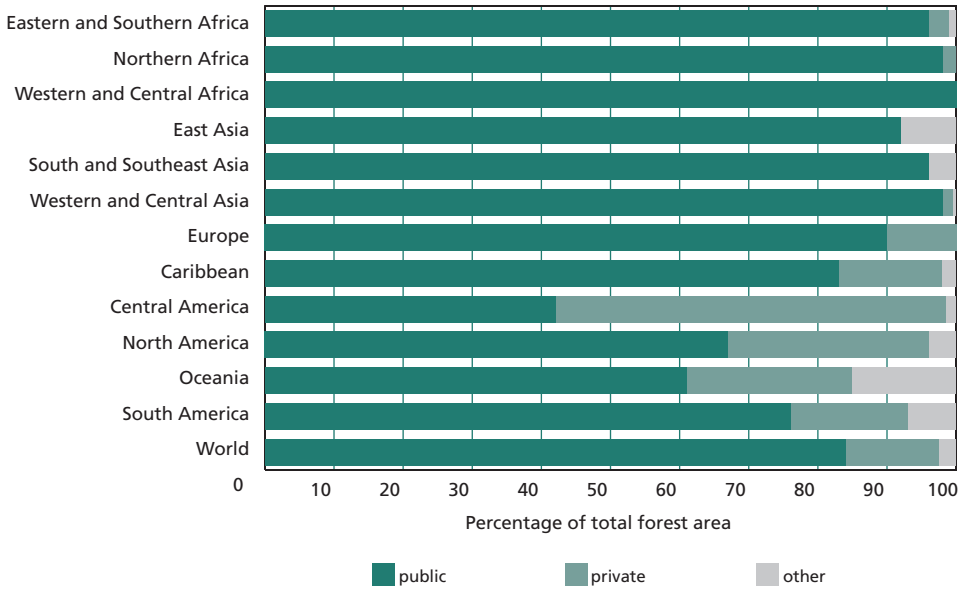


TABLE 7.8
Ownership of forest area 2000

Region/subregion	Information availability			Private ownership		Public ownership		Other ownership	
	Countries reporting	Forest area *(1 000)*	% of total forest area	1 000 ha	%	1 000 ha	%	1 000 ha	%
Eastern and Southern Africa	14	203 816	86.7	7 057	3.5	193 751	95.1	3 008	1.5
Northern Africa	12	126 452	93.0	2 124	1.7	124 209	98.2	119	0.1
Western and Central Africa	12	222 058	78.0	771	0.4	221 288	99.7	0	0
Total Africa	**38**	**552 326**	**84.3**	**9 951**	**1.8**	**539 248**	**97.6**	**3 127**	**0.6**
East Asia	5	225 663	100.0	18 875	8.4	206 788	91.6	0	0
South and Southeast Asia	17	297 379	100.0	8 835	3.0	285 478	96.0	3 066	1.0
Western and Central Asia	22	43 346	99.6	619	1.4	42 578	98.2	148	0.3
Total Asia	**44**	**566 388**	**100.0**	**28 329**	**5.0**	**534 845**	**94.4**	**3 214**	**0.6**
Total Europe	**39**	**998 071**	**100.0**	**99 631**	**10.0**	**897 059**	**89.9**	**1 380**	**0.1**
Caribbean	9	3 669	64.3	536	14.6	3 061	83.4	72	2.0
Central America	5	16 645	69.8	9 343	56.1	7 073	42.5	230	1.4
North America	4	677 971	100.0	198 645	29.3	452 343	66.7	26 982	4.0
Total North and Central America	**18**	**698 285**	**98.7**	**208 525**	**29.9**	**462 477**	**66.2**	**27 284**	**3.9**
Total Oceania	**11**	**204 933**	**98.5**	**48 575**	**23.7**	**125 527**	**61.3**	**30 831**	**15.0**
Total South America	**7**	**136 240**	**16.0**	**23 528**	**17.3**	**103 379**	**75.9**	**9 333**	**6.9**
World	**157**	**3 156 243**	**79.1**	**418 538**	**13.3**	**2 662 534**	**84.4**	**75 170**	**2.4**

FIGURE 7.7
Ownership of forests by subregion 2000



In terms of forest area, the regions or subregions accounting for the greatest area of private forests are North America (about 200 million hectares) and Europe (100 million hectares), followed by Oceania (49 million hectares).

Trends

Private ownership of forests is increasing, even though it is not possible to generalize the trend at the regional level (Table 7.9). Private forests represented 11 percent of global forests in 1990 and 13 percent in 2000. However, the increase involves limited geographical areas; the most relevant one is central Europe. There are no other significant trends at regional or subregional levels.

In the cases in which the proportion of private forests decreases, the phenomenon is generally linked to a decrease in the forest area (including public), not to a shift in forest ownership.

In Europe, private forests represented 8 percent of forests in 1990 and 9.7 percent in 2000 – an increase of 14 percent. Private forests have increased in almost all countries; however these changes are most significant in central and eastern Europe, where private forests increased from 2.5 million hectares to 7.5 million (i.e. from 7 percent to 23 percent of forest area) as a consequence of the privatization and restitution of forest land. The Baltic countries, the Czech Republic and Hungary show the highest rates of increase.

No conclusion can be drawn for Oceania, as Australia did not report data for 1990. However, private forests in New Zealand have increased to 33 percent, due primarily to an increase in the area of planted forests on private land.

In Asia, no major differences have been reported since 1990 for the region as a whole. At the country level, the only significant trends are the increased private forest area in the Philippines, mainly reflecting the expansion of forest plantations and despite the decrease in total forest area, and in Viet Nam, where private forests have increased by more than 2 million hectares as a result of the process of allocation of public forests to individual households (from 0.1 percent in 1990 to 18 percent in 2000 and 20 percent in 2005). No historical data are provided for China, which has also initiated a privatization process for forest resources.

TABLE 7.9
Trends in ownership of forest area 1990–2000

Region/subregion	Information availability (both years)			Private ownership		
				1 000 ha		Annual change rate 1990–2000
	Countries reporting	Forest area 2000	% of total forest area	1990	2000	(%)
Eastern and Southern Africa	14	203 816	86.7	7 555	7 057	-0.7
Northern Africa	11	126 135	92.8	2 189	2 116	-0.3
Western and Central Africa	12	222 058	78.0	690	771	1.1
Total Africa	**37**	**552 009**	**84.2**	**10 433**	**9 943**	**-0.5**
East Asia	5	225 663	100.0	19 147	18 875	-0.1
South and Southeast Asia	17	297 379	100.0	6 782	8 835	2.7
Western and Central Asia	21	43 215	99.3	528	540	0.2
Total Asia	**43**	**566 257**	**100.0**	**26 457**	**28 250**	**0.7**
Total Europe	**39**	**998 071**	**100.0**	**87 065**	**99 631**	**1.4**
Caribbean	8	3 623	63.5	646	505	-2.4
Central America	5	16 645	69.8	10 041	9 343	-0.7
North America	4	677 971	100.0	196 515	198 645	0.1
Total North and Central America	**17**	**698 239**	**98.7**	**207 202**	**208 494**	**0.1**
Total Oceania	**8**	**39 400**	**18.9**	**3 206**	**3 978**	**2.2**
Total South America	**5**	**106 360**	**12.5**	**12 038**	**23 478**	**6.7**
World	**149**	**2 960 336**	**74.2**	**346 402**	**373 773**	**0.8**

Note: As some countries did not report a complete series, figures for 2000 are slightly different from those presented in Table 7.8.

Finally, it is difficult to evaluate trends in Latin America, as not all countries have reported. The percentage of private forests has not changed in Chile, but has increased very significantly in Uruguay (58 percent) as a result of large-scale afforestation on private lands, encouraged by government incentives.

FOREST AREA DESIGNATED FOR SOCIAL SERVICES

The area of forests designated for social services indicates to what extent countries and forest managers are actively considering these services as part of the benefits of forests. According to the definitions for FRA 2005, social services may include recreation, tourism, education and conservation of sites with cultural or spiritual importance. The definition leaves space for interpretation by individual countries of what to include under this theme.

For FRA 2005, countries were asked to report two measures of forest designation:

- area of forest designated primarily for social services; and
- total area of forest designated for social services.

This is the first time that information on area designated for social services has been collected within the framework of the assessment. Thus it will be important to analyse carefully how the information provided by countries contributes to overall understanding of the use and functions of forest resources and how reporting can be further improved in future assessments.

Relatively few countries and territories (29 percent) reported having forest areas designated primarily for social services, and those that have reported are not necessarily representative of their entire region. This makes it difficult to draw any far-reaching conclusions on status and trends.

Information availability

Of the 229 countries and territories, 172 provided information on the social service function of their forests (Figure 7.8). Of these, only 66 countries and territories (representing about 53 percent of the world's forest area) reported actually having forest areas designated for social services, and only 60 countries have presented

Public ownership			Other ownership			Region/subregion
1 000 ha		Annual change rate 1990–2000	1 000 ha		Annual change rate 1990–2000	
1990	2000	(%)	1990	2000	(%)	
206 135	193 751	-0.6	3 292	3 008	-0.9	Eastern and Southern Africa
133 604	123 900	-0.8	94	119	2.4	Northern Africa
235 083	221 288	-0.6	0	0	0	Western and Central Africa
574 822	**538 939**	**-0.6**	**3 386**	**3 127**	**-0.8**	**Total Africa**
188 992	206 788	0.9	16	0	-100.0	East Asia
311 856	285 478	-0.9	4 507	3 066	-3.8	South and Southeast Asia
42 267	42 528	0.1	96	146	4.3	Western and Central Asia
543 115	**534 795**	**-0.2**	**4 619**	**3 212**	**-3.6**	**Total Asia**
902 051	**897 059**	**-0.1**	**183**	**1 380**	**22.4**	**Total Europe**
2 443	3 046	2.2	170	72	-8.2	Caribbean
9 147	7 073	-2.5	260	230	-1.2	Central America
452 227	452 343	n.s.	29 058	26 982	-0.7	North America
463 817	**462 461**	**n.s.**	**29 488**	**27 284**	**-0.8**	**Total North and Central America**
6 509	**6 219**	**-0.5**	**30 552**	**29 203**	**-0.5**	**Total Oceania**
60 590	**78 646**	**2.6**	**35 603**	**4 236**	**-19.2**	**Total South America**
2 550 904	**2 518 119**	**-0.1**	**103 831**	**68 443**	**-4.1**	**World**

complete trend data. The remaining countries and territories may still have areas designated for social services, but these are either included in other categories, such as 'multiple use', or could not be quantified.

There is considerable regional variation regarding data availability. East Asia, Europe and South America have good availability of information, while data are largely missing from the remaining subregions. For North America, no data are available for primary function, and only one reporting unit – Saint Pierre and Miquelon – has reported on total area of forest designated for social services.

Status

Table 7.10 shows a subregional summary of areas designated primarily for social services. Out of the total of 141 million hectares reported, one country – Brazil – accounts for about 80 percent, or 114 million hectares. It has reported all its 'indigenous lands' and 'sustainable development reserves' in this category. At the global level, 3.7 percent of forest area (1.7 percent if excluding Brazil) is estimated as having social services as the primary function. This percentage increases to 30.9 percent when looking at total area with this function.

As the Russian Federation accounts for most of the forest area in Europe, figures are provided for Europe including and excluding the Federation. It is worth noting that, without the Russian Federation, the forest area designated for social services in Europe is 8.3 percent of total forest area, which is a considerably higher percentage than for all other regions with the exception of South America, because of the large areas reported by Brazil.

Under total area with function (Table 7.11), Europe reports about 72 percent of its forest area. The high percentages for North America (100 percent) and Oceania (88 percent) are based on a few small countries that are not representative of the subregions.

The only clear conclusion to be drawn is that Europe seems to give the most attention to the social services provided by forest resources, through active designation of areas for this purpose. However, clearer definition of social services in future assessments could help reduce the inconsistencies caused by differing interpretations by the countries reporting.

FIGURE 7.8
Information availability – area of forest designated primarily for social services

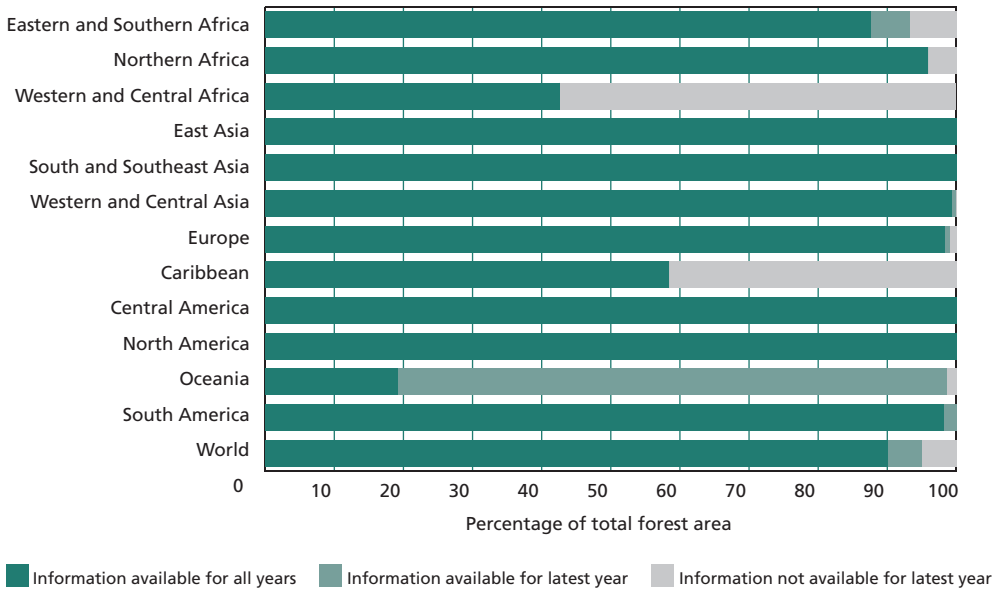


TABLE 7.10
Area of forest designated primarily for social services 2005

Region/subregion	Information availability			Area of forest designated primarily for social services	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	16	211 181	93.2	12	n.s.
Northern Africa	13	125 667	95.9	2	n.s.
Western and Central Africa	15	118 280	42.6	364	0.3
Total Africa	**44**	**455 129**	**71.6**	**377**	**0.1**
East Asia	5	244 862	100.0	2 620	1.1
South and Southeast Asia	17	283 126	100.0	143	0.1
Western and Central Asia	23	43 579	100.0	906	2.1
Total Asia	**45**	**571 567**	**100.0**	**3 669**	**0.6**
Total Europe	**36**	**991 192**	**99.0**	**22 477**	**2.3**
Caribbean	9	3 489	58.4	3	0.1
Central America	7	22 411	100.0	36	0.2
North America	4	677 464	100.0	0	0
Total North and Central America	**20**	**703 364**	**99.7**	**39**	**n.s.**
Total Oceania	**14**	**203 467**	**98.7**	**67**	**n.s.**
Total South America	**13**	**831 540**	**100.0**	**113 971**	**13.7**
World	**172**	**3 756 260**	**95.1**	**140 600**	**3.7**

Trends

The analysis of trends in area of forests primarily designated for social services is based on those countries or territories that have reported a complete time series (Table 7.12).

The strong trend for South America is entirely due to the reclassification by Brazil. Europe shows a decline under primary function, but a small increase under total area with function. The decline is mostly the result of reclassification of forests in the Russian Federation. Asia shows a slight upward trend, while the number of reporting countries in Africa, North and Central America and Oceania is too small to support a statement regarding trend.

TABLE 7.11
Total area of forest designated for social services 2005

Region/subregion	Information availability			Total area of forest designated for social services	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1 000 ha	% of forest area
Eastern and Southern Africa	2	77	n.s.	14	18.2
Northern Africa	0				
Western and Central Africa	4	45 840	16.5	293	0.6
Total Africa	**6**	**45 917**	**7.2**	**307**	**0.7**
East Asia	5	244 862	100.0	46 959	19.2
South and Southeast Asia	15	193 833	68.5	96 369	49.7
Western and Central Asia	7	8 427	19.4	2 896	34.4
Total Asia	**27**	**447 122**	**78.2**	**146 223**	**32.7**
Total Europe	**16**	**124 526**	**12.4**	**89 734**	**72.1**
Caribbean	3	524	8.8	130	24.9
Central America	0				
North America	1	3	n.s.	3	100.0
Total North and Central America	**4**	**527**	**0.1**	**133**	**25.3**
Total Oceania	**5**	**10 215**	**5.0**	**8 954**	**87.7**
Total South America	**2**	**485 761**	**58.4**	**128 763**	**26.5**
World	**60**	**1 114 068**	**28.2**	**374 116**	**33.6**

TABLE 7.12
Trends in area of forest designated primarily for social services 1990–2005

Region/subregion	Information availability (all 3 years)			Area of forest designated primarily for social services			Annual change rate *(%)*	
	Countries reporting	Forest area *(1 000 ha)*	% of total forest area	1990	2000	2005	1990–2000	2000–2005
Eastern and Southern Africa	15	198 343	87.6	12	12	12	0	0
Northern Africa	13	125 667	95.9	1	2	2	3.8	1.0
Western and Central Africa	15	118 280	42.6	367	371	364	0.1	-0.4
Total Africa	**43**	**442 291**	**69.6**	**380**	**384**	**377**	**0.1**	**-0.4**
East Asia	5	244 862	100.0	1 506	2 184	2 620	3.8	3.7
South and Southeast Asia	17	283 126	100.0	127	138	143	0.8	0.7
Western and Central Asia	21	43 272	99.3	1 445	702	906	-6.8	5.3
Total Asia	**43**	**571 259**	**99.9**	**3 078**	**3 023**	**3 669**	**-0.1**	**4.0**
Total Europe	**34**	**984 468**	**98.3**	**29 874**	**22 118**	**22 434**	**-3.0**	**0.3**
Caribbean	9	3 489	58.4	3	3	3	0	0
Central America	7	22 411	100.0	36	36	36	0	0
North America	4	677 464	100.0	0	0	0	0	0
Total North and Central America	**20**	**703 364**	**99.7**	**39**	**39**	**39**	**0**	**0**
Total Oceania	**11**	**39 593**	**19.2**	**60**	**60**	**60**	**0**	**0**
Total South America	**12**	**816 436**	**98.2**	**7 076**	**43 702**	**113 612**	**20.0**	**21.1**
World	**163**	**3 557 412**	**90.0**	**40 507**	**69 326**	**140 191**	**5.5**	**15.1**

Note: As some countries did not report a complete series, figures for 2005 are slightly different from those presented in Table 7.10.

Chapter 8

Progress towards sustainable forest management

Chapters 2–7 of this report focus on the results for individual thematic elements of sustainable forest management. As indicated in those chapters and as illustrated in Figure 8.1 below, forests are managed for a variety of uses and values. But how well are they managed? What does the information provided in FRA 2005 tell us about the overall progress towards sustainable forest management since 1990 on the global, regional and subregional scale?

The analysis presented in this chapter illustrates aggregated findings from FRA 2005. For the first time, an attempt has been made to present trends more broadly, covering six of the seven thematic elements of sustainable forest management.

The purpose is to shed more light on some of the complexities of sustainable forest management and stimulate additional analyses and debate, thus promoting decision-making and action for further progress towards sustainable forest management. Details of the data and analyses applied in this chapter are provided in FAO (2006b).

METHODOLOGY

Variable selection

For each of the six thematic elements, variables from the FRA 2005 reporting tables were selected based on relevance to the theme and on information availability for the variable. No relative weighting of variables was applied. An implicit weighting is, however, present, because one criteria in selecting the variables was that each thematic element should be represented by two to five variables.

Twenty-one variables were selected from 12 of the 15 reporting tables (Table 8.1). Some are derivations of the variables reported by countries: for example, carbon stock per hectare is derived from total carbon stock and forest area.

An increase in the value of a variable is generally interpreted as making a positive contribution to the thematic element (with the exception of area of forest affected by fire, insects and diseases or other disturbances) and thereby to sustainable forest management.

FIGURE 8.1
Designated functions of forests globally 2005
(%)

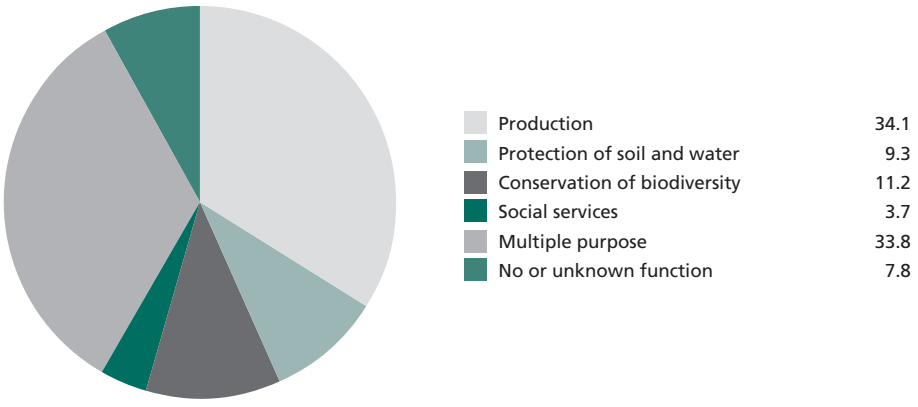


TABLE 8.1
List of variables selected for synthesis assessment by thematic area

Thematic element	FRA 2005 variables or derivatives	Unit
Extent of forest resources	Area of forest	ha
	Area of other wooded land	ha
	Growing stock of forests	m^3
	Carbon stock per hectare in forest biomass	tonnes/ha
Biological diversity	Area of primary forest	ha
	Area of forest designated primarily for conservation of biological diversity	ha
	Total forest area excluding area of productive forest plantations	ha
Forest health and vitality	Area of forest affected by fire	ha/year
	Area of forest affected by insects, diseases and other disturbances	ha/year
Productive functions of forest resources	Area of forest designated primarily for production	ha
	Area of productive forest plantations	ha
	Commercial growing stock	m^3
	Total wood removals	m^3/year
	Total NWFP removals	tonnes/year
Protective functions of forest resources	Area of forest designated primarily for protection	ha
	Area of protective forest plantations	ha
Socio-economic functions	Value of total wood removals	US$/year
	Value of total NWFP removals	US$/year
	Total employment	person years
	Area of forest under private ownership	ha
	Area of forest designated primarily for social services	ha

The extent to which this assumption holds depends on local or national circumstances. For example, an increase in forest area is likely to be seen as a positive development in most countries, but where it is a result of abandonment of agricultural land and declining rural populations, it may not be seen as positive by policy-makers or society.

Four variables were selected for analysis of the extent of forest resources: area of forest, area of other wooded land, total growing stock and carbon stock in forest biomass (per hectare).

The biological diversity theme is represented by the variables of area of primary forest, areas designated for conservation of biological diversity and total area of forest excluding productive forest plantations. While it is recognized that productive forest plantations may provide some biological diversity conservation values compared with other types of land cover, this is not the primary management purpose and these values are often limited. Primary forests are usually associated with high levels of biological diversity, particularly in tropical regions, but in temperate and boreal ecosystems, primary forests can present a limited number of species and may not be a good indicator of biological diversity *per se*. Yet area of primary forest is an important indicator of the status of the forest ecosystem as a whole.

Forest health and vitality is described by two variables indicating the area affected by fire, insects, diseases and other disturbances. Within this theme, stable or decreasing values are seen as a positive contribution to sustainable forest management. It is recognized that a number of forest ecosystems are dependant on fire to maintain their vitality and regenerative capacity (particularly in boreal zones). However, fires

frequently run wild and destroy large areas of forest, resulting in soil erosion and desertification – a serious threat to sustainable use of resources.

For the productive functions theme, these variables are taken into account: area of forest designated for productive purposes, area of productive forest plantations, commercial growing stock, total wood removals and NWFP removals for the four categories of products for which information availability is highest (see Chapter 5). It seeks to address the need to maintain an ample and valuable supply of primary forest products, while at the same time ensuring that production and harvesting are sustainable and do not compromise the management options of future generations. Thus an increase in wood removals may not be positive in all cases, as the level of removals may not be sustainable.

The protective functions theme is depicted by two variables indicating the total area of forest used primarily for protective functions and the area of forest plantations managed for protective purposes.

Socio-economic functions cover a wide range of forest benefits to mankind. The variables selected for this analysis are: level of private ownership, area of forest designated for recreation, education and other social services, total employment in forests and total value of removals. The level of private ownership is a somewhat ambiguous variable. In some situations, an increase in this variable may be seen as a benefit for sustainable forest management, indicating devolution of management responsibility and control to individuals or communities. In other cases, it may mean that forest property rights are being transferred from state or communal ownership and concentrated in the hands of relatively few within the community.

Information availability

Many countries have not been able to provide complete data for all variables or for each point in time. The extent to which countries can report on this limited set of variables also provides an indication of data availability and reporting capacity for the wider range of uses and values that societies expect of forests. However, presenting data as regional aggregations overcomes some of the limitations in data availability on regional and subregional scales. Poor quality, outdated or missing data are common problems in natural resource or environmental management. Effective analysis and synthesis can be used to expose weaknesses in data and identify those areas in which information collection efforts can be targeted to improve decision-making.

Rules were created for handling gaps in data in the regions and subregions as follows. Information availability was determined as the sum of the area of forest of those countries reporting on a given variable, expressed as a percentage of total forest area in the region or subregion. It is rated high if the reporting countries together represent 75–100 percent of the total forest area, medium if the countries represent 50–74 percent and low if the percentage is 25–49 percent. If the reporting countries together account for less than 25 percent of the total forest area in the region, no findings are presented owing to insufficient data.

Data analysis and presentation of results

The country data included in the calculations are those for which countries have reported a complete time series for the variable for all reporting years.

The change rate for variables on the subregional scale is expressed as the compound change rate in percent *per annum* for the period 1990–2005 (1990-2000 for area of forest affected by fire; area of forest affected by insects, diseases and other disturbances; total employment; and area of forest under private ownership). Thus the rate is based on two different estimates – the accuracy of which is unknown. An arbitrary threshold of +/-0.50 percent per year was selected for all variables in order to highlight large changes and to distinguish cases in which a difference between the two estimates may indicate an actual change from those in which the difference may not be statistically significant.

Simple, three-coloured 'traffic light' matrices were prepared to visualize change rates in the variables listed under each thematic area for a particular region. These indicate trends in the selected variables over time and the progress they reflect towards sustainable forest management. Trends can thus be positive, negative or with no major change (+/-0.50 percent per year) for each of the 21 variables.

Results are presented at global, regional and subregional levels and related to key statistics for each theme. For the subregional level, the number of positive and negative trends in each subregion was also related to two parameters – forest area and rural poor population – with the aim of illustrating progress towards sustainable forest management from different perspectives.

RESULTS

Global level

Table 8.2 summarizes trends in the selected variables at the global level.

Extent of forest resources. The area of forest has decreased by an average of 8.4 million hectares per year since 1990, or 0.21 percent per year. The other variables under this theme also show a decrease over time, but none of the change rates exceed the threshold of 0.50 percent annually.

TABLE 8.2
Trends towards sustainable forest management at the global level

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.21	-8 351	1 000 ha
	Area of other wooded land	M	-0.35	-3 299	1 000 ha
	Growing stock of forests	H	-0.15	-570	million m³
	Carbon stock per hectare in forest biomass	H	-0.02	-0.15	tonnes/ha
Biological diversity	Area of primary forest	H	-0.52	-5 848	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	1.87	6 391	1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.26	-9 397	1 000 ha
Forest health and vitality	Area of forest affected by fire	M	-0.49	-125	1 000 ha
	Area of forest affected by insects, diseases and other disturbances	M	1.84	1 101	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	-0.35	-4 552	1 000 ha
	Area of productive forest plantations	H	2.38	2 165	1 000 ha
	Commercial growing stock	H	-0.19	-321	million m³
	Total wood removals	H	-0.11	-3 199	1 000 m³
	Total NWFP removals	M	2.47	143 460	tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	1.06	3 375	1 000 ha
	Area of protective forest plantations	H	1.41	380	1 000 ha
Socio-economic functions	Value of total wood removals	L	0.67	377	million US$
	Value of total NWFP removals	M	0.80	33	million US$
	Total employment	M	-0.97	-102	1 000 pers. yrs
	Area of forest under private ownership	M	0.76	2 737	1 000 ha
	Area of forest designated primarily for social services	H	8.63	6 646	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

Biological diversity. The area of primary forest decreased by an average of 5.8 million hectares per year (excluding the Russian Federation, where large differences in the values for 1990 and 2005 were due to the introduction of a new classification system). On a positive note, the area of forest designated for conservation of biological diversity increased by about 6.4 million hectares per year during the same period – or a total of 96 million hectares.

Forest health and vitality. The area of forest adversely affected by insects, diseases and other disturbances shows an increase equivalent to 1.1 million hectares per year, while the area adversely affected by forest fires shows a small decrease. However, information was missing from many countries, particularly from Africa.

Productive functions of forest resources. The most prominent changes over time are a decrease in the area of forest designated primarily for productive purposes – an average of 4.6 million hectares per year – and an increase in area of productive forest plantations of 2.2 million hectares per year. This shift indicates that substantial areas of natural forests previously allocated for productive purposes are now designated for other uses, while the proportion of wood removals coming from forest plantations is likely to significantly increase in the future.

Protective functions of forests. Both variables under this theme show an increase since 1990. The area of forest designated primarily for protective purposes has thus increased by close to 3.4 million hectares per year or more than 50 million hectares during the last 15 years.

Socio-economic functions. The nominal values of removals of wood and non-wood forest products have increased, but less than the average rate of inflation. Employment in forest conservation and management has decreased by about 1 percent per year. The area of privately owned forests has increased by an average of 2.7 million hectares per year in the period 1990–2000 (2005 data not requested from countries). Area of forest designated for the provision of recreation, education and other social services has increased by more than 6.6 million hectares per year – or a total of 100 million hectares since 1990 – primarily due to a large increase in Brazil, which is partly offset by a much smaller decrease in the Russian Federation caused by a reclassification of forests.

Conclusions. Overall, the situation at the global level has remained relatively stable. Negative trends include decreases in area of primary forest and employment and an increase in area of forest adversely affected by insects, diseases and other disturbances. Positive trends were reported in the area of forest designated for biological diversity and social services, as well as for area of productive and protective forest plantations, value of wood removals and amount and value of NWFP removals, and area of forests under private ownership.

Africa

Table 8.3 summarizes trends in the selected variables for Africa.

Extent of forest resources. The region of Africa consists of three subregions (Eastern and Southern Africa, Northern Africa and Western and Central Africa). Area of forest decreased at an alarming rate during the period. There are indications, however, that the net loss of forests is slowing down. In the period 1990–2000, the net area change was about -4.4 million hectares per year, whereas in the period 2000–2005, it averaged -4.0 million hectares per year. The decrease in other wooded land was about half that of forest area (2.2 million hectares per year). The decrease in growing stock was below the threshold of 0.50 percent per year; however annual reductions in growing stock for the period were about 275 million m^3. Carbon stock per hectare did not change, but this probably reflects the fact that few countries have more than one estimate of growing stock over time. The overall trend for this theme is thus negative.

Biological diversity. The area of primary forest in Africa decreased by some 270 000 ha annually during 1990–2005. However, information for this variable was

TABLE 8.3
Trends towards sustainable forest management in Africa

Thematic element		Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	🔴	Area of forest	H	-0.64	-4 263	1 000 ha
	🔴	Area of other wooded land	M	-0.52	-2 193	1 000 ha
	🟡	Growing stock of forests	H	-0.41	-275	million m³
	🟡	Carbon stock per hectare in forest biomass	H	0.01	0.1	tonnes/ha
Biological diversity	🔴	Area of primary forest	M	-0.68	-270	1 000 ha
	🟡	Area of forest designated primarily for conservation of biological diversity	M	0.27	182	1 000 ha
	🔴	Total forest area excluding area of productive forest plantations	M	-0.75	-3 361	1 000 ha
Forest health and vitality	–	Area of forest affected by fire				1 000 ha
	–	Area of forest affected by insects, diseases and other disturbances				1 000 ha
Productive functions of forest resources	🔴	Area of forest designated primarily for production	M	-0.64	-911	1 000 ha
	🟡	Area of productive forest plantations	M	0.41	42	1 000 ha
	🟡	Commercial growing stock	M	-0.39	-22	million m³
	🟢	Total wood removals	H	1.89	10 767	1 000 m³
	–	Total NWFP removals				tonnes
Protective functions of forest resources	🟡	Area of forest designated primarily for protection	M	-0.25	-52	1 000 ha
	🟢	Area of protective forest plantations	M	1.22	26	1 000 ha
Socio-economic functions	–	Value of total wood removals				million US$
	–	Value of total NWFP removals				million US$
	🟢	Total employment	L	3.44	12	1 000 pers. yrs
	🟡	Area of forest under private ownership	H	-0.48	-49	1 000 ha
	🟡	Area of forest designated primarily for social services	M	-0.04	-0.2	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

🟢 = Positive change (greater than 0.50%)
🟡 = No major change (between -0.50 and 0.50%)
🔴 = Negative change (less than -0.50%)
– = Insufficient data to determine trend

based on 46 countries that together account for 67 percent of the forest area, with information missing from most of the countries in the Congo Basin (which represents the second largest area of tropical primary forest after the Amazon Basin). Some of this decrease was caused by deforestation, some by alteration of forests through selective logging and other human interventions. This 'altered' forest area was subsequently classified as modified natural forest. On a positive note, there has been an increase in the area of forest designated primarily for conservation of biological diversity of close to 3 million hectares since 1990.

Forest health and vitality. Data availability was insufficient for trend analysis.

Productive functions of forest resources. There was a steady increase in wood removals from 500 million m³ in 1990 to 661 million m³ in 2005, or an annual increase of almost 11 million m³. Yet the area designated for production of wood and non-wood forest products decreased by nearly a million hectares per year. Most of the increase in wood removals stemmed from increased production of fuelwood – on average, an increase of more than 9 million m³/year – particularly in Western and Central Africa. A large part of this may have been collected from areas outside forests (other wooded land and trees outside forests). Some may have come from forests designated for multiple

purposes – including community forests – rather than from forests designated primarily for productive purposes.

Protective functions of forest resources. The area of forest designated for protective functions shows a slight decrease, while the area of protective forest plantations shows an increase.

Socio-economic functions. The status of the information is generally quite weak and data availability is low for most of the variables under this theme. Employment in forest management and conservation seemed to have increased, while the area under private ownership declined.

Conclusions. On the whole, progress towards sustainable forest management in Africa appears to have been limited during the last 15 years. There are some indications that the net loss of forest area has slowed down and that the area of forest designated for conservation of biological diversity increased slightly. However, the continued, rapid loss of forest area (the largest of any region during this 15-year period) is particularly disconcerting. A summary of information by subregion can be found in Table 8.9.

Asia

Table 8.4 summarizes trends in the selected variables for Asia.

Extent of forest resources. The region of Asia consists of three subregions showing great variation (East Asia, South and Southeast Asia and Western and Central Asia). In the period 1990–2005, area of forest was virtually stable, with an annual decrease of 191 000 ha or -0.03 percent. However, it should be noted that, within this period, a net loss of forests of about 792 000 ha per year in the 1990s was reversed into an annual net gain of 1 million hectares in the period 2000–2005, largely due to increased plantation activity in the region, particularly in China. The annual net loss of forests in South and Southeast Asia averaged about 2.7 million hectares per year. In the period 1990–2005, the regional net annual decrease in growing stock was about 290 million m^3/year. There was, however, a large variation among the three subregions, with an annual net increase of 260 million m^3 in East Asia and 13 million m^3 in Western and Central Asia. In South and Southeast Asia the annual net decrease was 559 million m^3. Carbon stock per hectare was largely unchanged – reflecting the fact that few countries had more than one estimate of growing stock per hectare over time. Over the last 15 years, the regional trend for this theme was largely stable or slightly negative, with some recent positive trends in a number of countries.

Biological diversity. The area of primary forest decreased at the alarming rate of 1.5 million hectares per year during the last 15 years – entirely explained by large losses in the subregion of South and Southeast Asia, particularly in Indonesia. The cause of the decrease was not only deforestation but also alteration of forests through selective logging and other human interventions, which resulted in a subsequent classification of such forests as modified natural forest. About 13 percent of the forest area is currently designated primarily for conservation of biological diversity, representing an average annual increase of some 850 000 ha or about 1.3 percent since 1990.

Forest health and vitality. The area affected by fire and other disturbances increased slightly, but data for the area of forest affected by insects, diseases and other disturbances were generally quite weak.

Productive functions of forest resources. The forest area designated primarily for the production of wood and non-wood forest products decreased by an average of 774 000 ha per year, while the area of productive forest plantations increased by an average of about 1 million hectares per year or 2.9 percent. In the last five years, the area of productive forest plantations increased by 1.6 million hectares per year, which is the highest increase of any region. This rapid expansion took place primarily in China, where the area of productive forest plantations increased by about 460 000 ha/year in the 1990s and 1.35 million hectares per year in the period 2000–2005 – an increase of

TABLE 8.4
Trends towards sustainable forest management in Asia

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.03	-194	1 000 ha
	Area of other wooded land	M	-0.36	-697	1 000 ha
	Growing stock of forests	H	-0.58	-286	million m³
	Carbon stock per hectare in forest biomass	H	-0.15	-1	tonnes/ha
Biological diversity	Area of primary forest	H	-1.52	-1 510	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	1.31	848	1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.23	-1 224	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	1.15	127	1 000 ha
	Area of forest affected by insects, diseases and other disturbances	M	0.30	35	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	-0.30	-774	1 000 ha
	Area of productive forest plantations	H	2.90	1 033	1 000 ha
	Commercial growing stock	M	0.51	95	million m³
	Total wood removals	H	-1.49	-6 116	1 000 m³
	Total NWFP removals	M	3.71	160 796	tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	1.94	2 325	1 000 ha
	Area of protective forest plantations	H	0.99	187	1 000 ha
Socio-economic functions	Value of total wood removals	H	-2.27	-452	million US$
	Value of total NWFP removals	L	1.40	191	million US$
	Total employment	H	-1.15	-100	1 000 pers. yrs
	Area of forest under private ownership	H	0.66	179	1 000 ha
	Area of forest designated primarily for social services	H	1.18	39	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

193 percent compared with the previous decade. Total wood removals have decreased significantly during this period – also partly because of China, where a logging ban was in effect for a large part of the forest area and wood is now being imported – including from outside the region. Several countries noted that the figures for wood removals submitted do not take into account illegal removals or informal collection of fuelwood, so actual removals may be underestimated.

Protective functions of forest resources. Both the area of forest designated for protective purposes and the area of forest plantations managed for this purpose show an increase, reflecting a greater attention to the role forests play in the conservation of soil and water and other protective functions.

Socio-economic functions. The value of wood removals decreased, over and above the decrease in the amount of wood removed, while the value of NWFPs increased during the last 15 years. Employment also shows a reduction, while the area of forest under private ownership and the areas designated for recreation, education and other social services increased.

Conclusions. Overall, forest area was almost the same in 2005 as in 1990 (572 million hectares versus 574 – or a decrease of 0.03 percent per year), owing to large-scale afforestation

efforts during the last 7-8 years, particularly in China. Forest health deteriorated, but forest fires, pests and diseases were still affecting a relatively small proportion of the total forest area in Asia (2.2, 2.6 and 2.4 percent respectively). The rapid decrease in area of primary forest is cause for concern, while the increase in area designated for conservation of biological diversity and for protective functions is commendable. In short, there has been mixed progress over the last 15 years. A summary of information by subregion can be found in Table 8.9.

Europe

Table 8.5 summarizes trends in the selected variables for Europe.

Extent of forest resources. Forest area in Europe increased by an average of 805 000 ha per year or 0.08 percent of total forest area. Over the last 15 years, total growing stock increased by nearly 340 million m^3 per year and forests in Europe became more densely stocked. Average volume per hectare increased from 103 to 107 m^3/ha (124 to 141m^3/ha excluding the Russian Federation – an annual increase of 1.2 m^3 per hectare per year), which also means that forests were sequestrating more carbon. The area of other wooded land, on the other hand, diminished at a rate of 0.28 percent – or 286 000 ha – per year.

TABLE 8.5
Trends towards sustainable forest management in Europe

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	0.08	805	1 000 ha
	Area of other wooded land	H	-0.28	-286	1 000 ha
	Growing stock of forests	H	0.33	340	million m^3
	Carbon stock per hectare in forest biomass	H	0.02	0.1	tonne/ha
Biological diversity	Area of primary forest	H	0.37	956	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	4.72	1 224	1 000 ha
	Total forest area excluding area of productive forest plantations	H	0.03	332	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	4.27	54	1 000 ha
	Area of forest affected by insects, diseases and other disturbances	H	6.27	729	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	-0.44	-3 277	1 000 ha
	Area of productive forest plantations	H	1.71	322	1 000 ha
	Commercial growing stock	H	-0.52	-322	million m^3
	Total wood removals	H	-0.67	-4 783	1 000 m^3
	Total NWFP removals	H	-0.49	-1 872	tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	0.99	826	1 000 ha
	Area of protective forest plantations	H	1.86	97	1 000 ha
Socio-economic functions	– Value of total wood removals				million US$
	Value of total NWFP removals	H	1.46	22	million US$
	Total employment	H	-2.61	-23	1 000 pers. yrs
	Area of forest under private ownership	H	1.36	1 257	1 000 ha
	Area of forest designated primarily for social services	H	-1.89	-496	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

Biological diversity. Four percent of forest area is currently designated primarily for conservation of biological diversity. If the Russian Federation is excluded, the share is about 12 percent. There was a large increase in this area since 1990 (1.2 million hectares per year). The figures on primary forest include the Russian Federation, in which large changes were primarily owing to the introduction of a new classification system. Excluding the Federation, there was still a slight increase, which is explained by the fact that areas of natural forest have been set aside and protected from human intervention. With time, these areas evolve into forests in which there are no clearly visible indications of human activity and ecological processes are not significantly disturbed, which is the definition of primary forests used in FRA 2005.

Forest health and vitality. An increase in the average area of forest affected by other disturbances was evident when comparing the 1988–1992 period with that of 1998–2002. The storms that hit Europe in December 1999 may have resulted in an increase in areas affected by insects and diseases as well. The area affected by forest fires also increased during this period in relative or percentage terms, but was still a very small proportion (0.2 percent) of the total forest area.

Productive functions of forest resources. The total volume of wood removals and commercial growing stock decreased in the last 15 years. There was a large increase in area of productive forest plantations, almost 5 million hectares during 1990–2005 or an annual increase of about 1.7 percent. The area of forest used primarily for wood production decreased and forest plantations now account for a larger proportion of forest area available for wood supply. The change in area of forest designated primarily for production was less than 0.5 percent per year. However, this area has decreased by close to 50 million hectares since 1990, with corresponding gains in the areas of forest designated for multiple-purpose, conservation and protective functions.

Protective functions of forest resources. The area of forest designated primarily for protection increased by more than 800 000 ha per year for the period 1990–2005.

Socio-economic functions. The area of forest under private ownership increased by more than 1 million hectares per year. To a large extent this is owing to the ongoing privatization process in central and eastern European countries. The level of employment in forest conservation and management decreased – probably due to an increase in mechanization and streamlining in organizations, as well as to a decrease in the amount of wood removals. The area of forest designated primarily for the provision of recreation, education and other social services decreased since 1990, mainly as a result of the reclassification of forests in the Russian Federation during this period. The total area of forest in Europe providing such services (as either primary or secondary function) is the highest in the world (72 percent of total forest area).

Conclusions. Data availability was high and the status of forest resources in Europe was essentially stable, although forests in Europe suffered from occasional storms. The severe storms of 1999 were the main reason for the negative trend in the health and vitality of forests. The focus of forest management in Europe has clearly shifted away from productive functions towards conservation of biological diversity, protection and multiple uses.

North and Central America

Table 8.6 summarizes trends in the selected variables for North and Central America.

Extent of forest resources. The region of North and Central America consists of three subregions (the Caribbean, Central America and North America). Forest area for the region as a whole is virtually the same as in 1990, as is the area of other wooded land. There was a decrease in forest area in Central America of about 350 000 ha per year for the period 1990–2005. In North America, forest area decreased by about 100 000 ha annually from 2000 to 2005 – down from a net increase of 17 000 ha per year in 1990–2000. This current net loss of forests was primarily due to a decrease in

TABLE 8.6
Trends towards sustainable forest management in North and Central America

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.05	-329	1 000 ha
	Area of other wooded land	M	0.01	16	1 000 ha
	Growing stock of forests	H	0.23	159	million m³
	Carbon stock per hectare in forest biomass	L	0.05	0.3	tonnes/ha
Biological diversity	Area of primary forest	H	-0.17	-545	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	0.86	712	1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.12	-800	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	-0.14	-6	1 000 ha
	Area of forest affected by insects, diseases and other disturbances	H	0.88	307	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	-0.05	-21	1 000 ha
	Area of productive forest plantations	H	3.46	471	1 000 ha
	Commercial growing stock	H	0.27	160	million m³
	Total wood removals	H	-0.14	-1 201	1 000 m³
	– Total NWFP removals				tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	2.85	77	1 000 ha
	Area of protective forest plantations	H	13.14	67	1 000 ha
Socio-economic functions	Value of total wood removals	M	4.19	617	million US$
	Value of total NWFP removals	M	2.66	1.6	million US$
	Total employment	H	0.98	4.8	1 000 pers. yrs
	Area of forest under private ownership	H	0.06	129	1 000 ha
	Area of forest designated primarily for social services	H	0	0	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

= Positive change (greater than 0.50%)
= No major change (between -0.50 and 0.50%)
= Negative change (less than -0.50%)
– = Insufficient data to determine trend

the forest plantation establishment rate in the United States (down from an average of 596 900 ha/year in 1990–2000 to an average of 157 400 ha/year in the period 2000–2005) and the continued, albeit decreasing, net loss of forests in Mexico. In contrast, there was an annual increase in forest area of about 40 000 ha in the Caribbean subregion, mainly due to natural expansion onto abandoned agricultural land. There is limited information on carbon stock in forests, due to lack of information from Canada and an incomplete dataset from the United States.

Biological diversity. There were decreases in the areas of primary forest and of total forest excluding productive forest plantations, but the change rates were below 0.2 percent per year. The area of forest designated for conservation of biological diversity increased by 712 000 ha per year since 1990, or more than 10 million hectares in total.

Forest health and vitality. The area adversely affected by forest fires shows only limited changes over time, while the area affected by insects, diseases and other disturbances increased.

Productive functions of forest resources. The most prominent change over time was the increase in area of productive forest plantations – from 3.3 percent of total forest area in 1990 to 5.1 percent in 2000 and 5.4 percent in 2005. The area of forest designated

primarily for productive purposes remained fairly stable, while total wood removals decreased slightly, by 1.2 million m^3 per year – or 0.14 percent.

Protective functions of forest resources. Both of the variables related to protective functions showed an increase in relative (percentage) terms during the last 15 years. However, the increases in absolute terms were fairly small compared with other variables.

Socio-economic functions. The value of both wood and non-wood forest products increased since 1990, despite a slight decrease in the amount of wood removals. The level of employment in forest conservation and management also shows an increase.

Conclusions. Progress towards sustainable forest management was generally positive in North and Central America as a whole during the period 1990–2005, with none of the annual rates of negative trends being more than 0.20 percent – except for the area adversely affected by insects, diseases and other disturbances. There was, however, considerable variation among subregions, as can be seen in Table 8.9.

Oceania

Table 8.7 summarizes trends in the selected variables for Oceania.

Extent of forest resources. Area of forest was essentially stable over the period 1990–2005. The reported annual change was -417 000 ha per year or -0.2 percent per year. Information availability was insufficient to determine trends in the remaining variables under this theme.

Biological diversity. There was a slight increase in area of primary forest. Information availability was insufficient on area of forest designated for biological diversity conservation (1990 data were missing for Australia). Total forest area, excluding area of productive forest plantations, decreased slightly, following the trend for forest area as a whole.

Forest health and vitality. Data availability was insufficient for trend analysis.

Productive functions of forest resources. Information availability was insufficient on area of forest designated for productive purposes (1990 data were missing for Australia) and on commercial growing stock. The area of productive forest plantations increased, as did the amount of wood removals.

Protective functions of forest resources. Information availability was insufficient on area of forest designated for protective purposes (1990 data were missing for Australia). However, the area of protective forest plantations increased at the very high rate of 28 percent per year, from 500 ha in 1990 to 3 100 ha in 2000 and 21 100 in 2005.

Socio-economic functions. The number of persons employed in the primary production of forest goods and services and related activities increased from 1990 to 2000 (data not requested for 2005). Information availability was insufficient for an analysis of the other variables.

Conclusions. The status of the information for Oceania was generally very weak, and low data availability was a serious issue in the region. Data were insufficient for determining regional trends for two-thirds of the variables. Thus it is difficult to assess progress towards sustainable forest management.

South America

Table 8.8 summarizes trends in the selected variables for South America.

Extent of forest resources. Forest area in South America decreased at an alarming rate and continues to do so. The annual net loss during the period 1990–2000 was 3.8 million hectares, and in the period 2000–2005 the annual net loss increased to 4.3 million hectares, which was the highest annual net loss of any region during this five-year period and corresponds to almost 60 percent of the total annual net loss. However, it should be noted that the figures for Brazil referred to areas of forest cleared, without taking into account the part of clear-cut areas that may have regenerated and returned to forest. Net loss for the region as a whole may thus be overestimated and was below the threshold of 0.50 percent per year for the period 1990–2005 as a whole. Growing stock

TABLE 8.7
Trends towards sustainable forest management in Oceania

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.20	-417	1 000 ha
	– Area of other wooded land				1 000 ha
	– Growing stock of forests				million m³
	– Carbon stock per hectare in forest biomass				tonnes/ha
Biological diversity	Area of primary forest	H	0.24	82	1 000 ha
	– Area of forest designated primarily for conservation of biological diversity				1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.23	-471	1 000 ha
Forest health and vitality	– Area of forest affected by fire				1 000 ha
	– Area of forest affected by insects, diseases and other disturbances				1 000 ha
Productive functions of forest resources	– Area of forest designated primarily for production				1 000 ha
	Area of productive forest plantations	H	3.00	91	1 000 ha
	– Commercial growing stock				million m³
	Total wood removals	H	2.56	1 348	1 000 m³
	– Total NWFP removals				tonnes
Protective functions of forest resources	– Area of forest designated primarily for protection				1 000 ha
	Area of protective forest plantations	H	28.34	1.4	1 000 ha
Socio-economic functions	– Value of total wood removals				million US$
	– Value of total NWFP removals				million US$
	Total employment	H	0.79	0.3	1 000 pers. yrs
	– Area of forest under private ownership				1 000 ha
	– Area of forest designated primarily for social services				1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

= Positive change (greater than 0.50%)
= No major change (between -0.50 and 0.50%)
= Negative change (less than -0.50%)
– = Insufficient data to determine trend

followed the trend of total forest area, while carbon stock per hectare reportedly did not change – probably reflecting the fact that few countries had more than one estimate of growing stock over time.

Biological diversity. Primary forests currently account for 77 percent of total forest area in the region but continue to decrease rapidly. The net loss of primary forest increased from 3.0 million hectares per year in the period 1990–2000 to almost 3.9 million hectares in the period 2000–2005. Apart from deforestation, the decrease was caused by alteration of forests through selective logging and other human interventions, which resulted in a subsequent classification of such forests as modified natural forests. On a positive note, the area of forest designated primarily for conservation of biological diversity increased by about 3.3 million hectares per year in the last 15 years, or a total of 50 million hectares – equivalent in size to the area of primary forest lost during this period.

Forest health and vitality. The area of forest adversely affected by fire and other disturbances increased, but was still relatively small (less than 1 percent combined). However, some countries presented incomplete information on this topic, so the figures should be considered underestimates.

TABLE 8.8
Trends towards sustainable forest management in South America

Thematic element	Trends in FRA 2005 variables or derivatives	Data availability	1990–2005 Annual change rate (%)	1990–2005 Annual change	Unit
Extent of forest resources	Area of forest	H	-0.46	-3 952	1 000 ha
	Area of other wooded land	L	-0.13	-138	1 000 ha
	Growing stock of forests	M	-0.51	-503	million m³
	Carbon stock per hectare in forest biomass	H	0	0	tonnes/ha
Biological diversity	Area of primary forest	H	-0.53	-3 297	1 000 ha
	Area of forest designated primarily for conservation of biological diversity	H	3.69	3 342	1 000 ha
	Total forest area excluding area of productive forest plantations	H	-0.49	-3 872	1 000 ha
Forest health and vitality	Area of forest affected by fire	H	1.00	1	1 000 ha
	Area of forest affected by insects, diseases and other disturbances	M	4.13	46	1 000 ha
Productive functions of forest resources	Area of forest designated primarily for production	H	0.21	190	1 000 ha
	Area of productive forest plantations	H	2.16	207	1 000 ha
	Commercial growing stock	M	-0.97	-229	million m³
	Total wood removals	H	-0.76	-3 214	1 000 m³
	Total NWFP removals	M	-2.14	-16 800	tonnes
Protective functions of forest resources	Area of forest designated primarily for protection	H	0.21	195	1 000 ha
	Area of protective forest plantations	H	7.48	1	1 000 ha
Socio-economic functions	Value of total wood removals	H	-1.23	-760	million US$
	Value of total NWFP removals	M	-5.10	-15	million US$
	– Total employment				1 000 pers. yrs
	– Area of forest under private ownership				1 000 ha
	Area of forest designated primarily for social services	H	20.33	7 102	1 000 ha

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

= Positive change (greater than 0.50%)
= No major change (between -0.50 and 0.50%)
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– = Insufficient data to determine trend

Productive functions of forest resources. The area designated for productive functions was essentially stable, while the area of productive forest plantations increased. Total wood removals decreased by about 3.2 million m³ per year. This was caused by a decrease in the amount of fuelwood removals of 8.6 million m³ per year, partly offset by an increase in the amount of removals of industrial wood of 5.3 million m³ per year. Commercial growing stock and NWFP removals decreased during the period.

Protective functions of forest resources. Both variables showed an increase since 1990. Protective forest plantations increased by 7.5 percent per year, but the area is still relatively small (31 000 ha in 2005 – or 0.004 percent of total forest area).

Socio-economic functions. The area designated for social services increased by more than 7 million hectares per year since 1990. This mainly reflected the allocation of large areas in Brazil as 'indigenous lands' and 'sustainable development reserves', where both of these categories were classified as designated for social services.

Conclusions. Overall, progress towards sustainable forest management was mixed in South America. The increasing trend in the area of net forest loss is cause for concern, as is the rate of loss of primary forest. Yet there were also positive signs in the increased areas of forest designated for conservation of biological diversity and for social services.

The decrease in removals of fuelwood may reflect a reduced demand for this product in the region, but was partly offset by an increase in removals of industrial wood. The area of productive forest plantations increased and may meet a larger proportion of the demand for wood in the future.

Subregional level

Three regions (Africa, Asia and North and Central America) having significant intraregional differences were divided into three subregions each and subregional trends were determined using the same method used for the regions. No subdivisions were made of Europe, Oceania and South America, which can be considered relatively homogeneous with respect to the variables studied. The possible exception is Europe, where the Russian Federation dominates owing to its size, but the preference in this study was not to single out any individual country in the presentation. The resulting set of 12 subregions and regions constituted the basis for the analysis in this section, and as a set is referred to as the 'subregions'. Table 8.9 summarizes the results for each subregion and illustrates some important intraregional differences.

In Africa, Western and Central Africa had more positive trends than negative ones, while Eastern and Southern Africa had predominantly negative trends. However, it is also noteworthy that information availability for Western and Central Africa was generally poorer than for the other subregions (except for the extent of forest resources), which may have affected the results. North America and the Caribbean also had a majority of positive trends, whereas Central America had a preponderance of negative ones. The most significant difference occurs in Asia, where East Asia had a strong set of positive trends, while the South and Southeast Asia subregion was dominated by negative trends. Clearly, the division into subregions reveals trend patterns that are not prominent on a regional scale, just as the regional breakdown highlighted variations masked on the global scale. As is also clear from Table 8.9, there is a mix of positive and negative trends in all subregions.

In considering progress towards sustainable forest management, the very large differences among the subregions in size and population structure must be taken into consideration. Two parameters – forest area (Table 1 in Chapter 2) and the number of rural poor people (Table 3 in Chapter 1) – were selected and applied as arbitrary weights to indicate the relative significance of the observed trends (Figure 8.2).

When weighting by forest area, Europe, North America and South America dominate the picture. It is also clear that Europe and North America contribute considerably to the positive and stable trends and less to the negative ones, whereas the trends for South America are mostly negative. Overall, there seems to be a balance between positive and negative trends, assuming that the selected variables are valid, that they are all weighted equally and that a weighting by forest area of each subregion is relevant.

When weighting by rural poor population, the picture becomes dramatically different. Some of the African subregions are more prominent, and the subregion of South and Southeast Asia dominates. Obviously, the developed regions become less significant, as there are relatively few rural poor in these areas. Compared with the weighting by forest area, there is a higher proportion of negative trends from this poverty perspective.

DISCUSSION

Approach and limitations

Several disclaimers must be advanced regarding the methodology and findings presented in this chapter:

- As stated in Chapter 1, the variables in FRA 2005 do not address all aspects of sustainable forest management.
- Information availability is not satisfactory for all variables, which leaves a number of gaps in the analysis.
- Selection of variables is subjective and may not be valid in other contexts or scales.

TABLE 8.9
Trends towards sustainable forest management by subregion

Themes and variables	Africa			Asia		
	Eastern and Southern	Northern	Western and Central	East	South and Southeast	Western and Central
Extent of forest resources						
Area of forest	H	H	H	H	H	H
Area of other wooded land	M	L	H	H	M	H
Growing stock of forests	H	H	H	H	H	H
Carbon stock per hectare in forest biomass	H	H	H	H	H	H
Biological diversity						
Area of primary forest	H	H	L	H	H	H
Area of forest designated primarily for conservation of biological diversity	H	H	L	H	H	H
Total forest area excluding area of productive forest plantations	H	H	L	H	H	H
Forest health and vitality						
Area of forest affected by fire	–	–	–	H	H	H
Area of forest affected by insects, diseases and other disturbances	–	–	–	H	L	M
Productive functions of forest resources						
Area of forest designated primarily for production	H	H	L	H	H	H
Area of productive forest plantations	H	H	L	H	H	H
Commercial growing stock	H	L	L	H	M	H
Total wood removals	H	H	H	H	H	H
Total NWFP removals	–	–	–	H	L	M
Protective functions of forest resources						
Area of forest designated primarily for protection	H	H	L	H	H	H
Area of protective forest plantations	H	H	L	H	H	H
Socio-economic functions						
Value of total wood removals	–	L	–	H	H	H
Value of total NWFP removals	–	M	–	–	L	M
Total employment	L	M	L	H	M	H
Area of forest under private ownership	H	H	H	H	H	H
Area of forest designated primarily for social services	H	H	L	H	H	H

H = High (reporting countries represent 75–100% of total forest area)
M = Medium (reporting countries represent 50–75% of total forest area)
L = Low (reporting countries represent 25–50% of total forest area)

● = Positive change (greater than 0.50%)
● = No major change (between -0.50 and 0.50%)
● = Negative change (less than -0.50%)
– = Insufficient data to determine trend

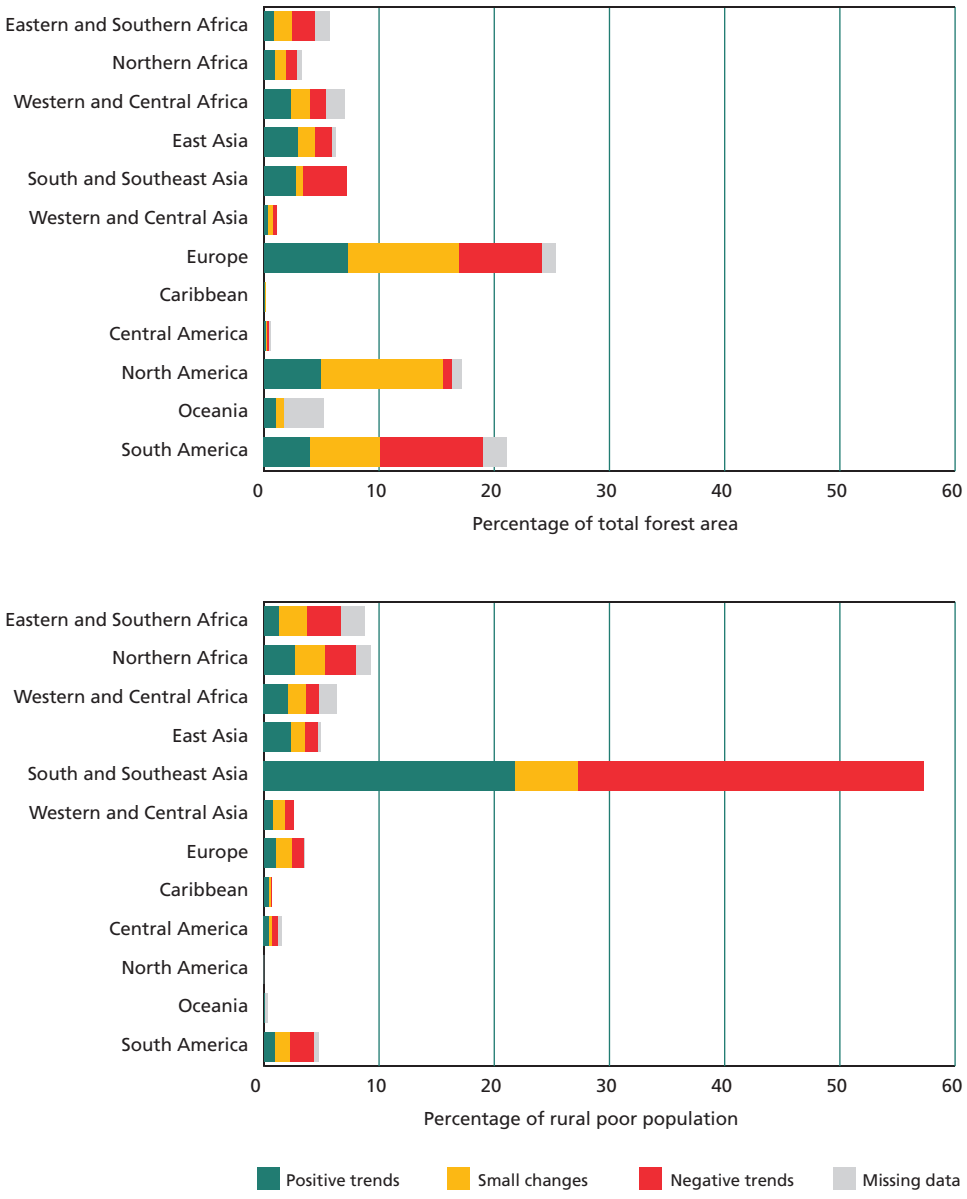
- Indications of positive or negative values for trends can be argued in several cases, particularly if the trend is seen in a bigger policy perspective. For example, the loss of forest area can be positive if agricultural development and efforts to improve food security and self-sufficiency are national priorities.
- Indications of positive or negative trends are not presented in relation to the current status of forests and their management.
- Although no weights are explicitly applied in the analyses, the selection of certain variables is in itself a weighting.
- Aggregation of trends by region and subregion obscures positive or negative trends in individual countries. Results cannot therefore be seen as applicable to individual countries in any region.

Europe	North and Central America			Oceania	South America	Themes and variables
	Caribbean	Central	North			
						Extent of forest resources
H	H	H	H	H	H	Area of forest
H	H	H	M	–	L	Area of other wooded land
H	H	H	H	–	M	Growing stock of forests
H	L	–	–	–	M	Carbon stock per hectare in forest biomass
						Biological diversity
H	M	H	H	H	H	Area of primary forest
H	M	H	H	–	H	Area of forest designated primarily for conservation of biological diversity
H	M	H	H	H	H	Total forest area excluding area of productive forest plantations
						Forest health and vitality
H	M	–	H	–	H	Area of forest affected by fire
H	–	–	H	–	M	Area of forest affected by insects, diseases and other disturbances
						Productive functions of forest resources
H	M	H	H	–	H	Area of forest designated primarily for production
H	M	H	H	H	H	Area of productive forest plantations
H	M	M	H	–	M	Commercial growing stock
H	H	H	H	H	H	Total wood removals
H	L	–	–	–	M	Total NWFP removals
						Protective functions of forest resources
H	M	H	H	–	H	Area of forest designated primarily for protection
H	M	H	H	H	H	Area of protective forest plantations
						Socio-economic functions
–	L	H	M	–	H	Value of total wood removals
H	L	–	M	–	M	Value of total NWFP removals
H	H	M	H	H	–	Total employment
H	M	M	H	–	–	Area of forest under private ownership
H	M	H	H	–	H	Area of forest designated primarily for social services

The analysis is clearly sensitive to the selection of variables. The options for variables were limited by the set of FRA 2005 reporting tables and further reduced by the information availability for several of these. In addition, there is a high covariation between some variables, which must be considered before drawing far-reaching conclusions from the findings.

The methodology used to illustrate these key trends does not take into account value judgments or variations in stakeholder perceptions of forest benefits and the relative importance of different variables. While such evaluation methodologies exist, e.g. Delphi approaches, which were tested in the FRA 2005 process (FAO, 2003c), the objectives of this study were to provide an example of how existing information, collected as part of FRA 2005, can be used in an initial analysis of progress towards sustainable forest management and to stimulate further discussion and more detailed analyses.

FIGURE 8.2
Distribution of subregional trends[1]



[1] The number of observed trends for each subregion in Table 8.9 has been multiplied by forest area (top), and number of rural poor (bottom). The results have been scaled to show the proportion in percentages of observed changes in each case.

In conclusion, the analyses and presentations in this chapter are limited by the variables and data available in the FRA 2005 reporting tables. Many relevant parameters are not included owing to lack of information at the global level, and a more detailed analysis must take into consideration the varying conditions between regions and countries. It should also be noted that the analyses do not cover all aspects of sustainable forest management: the thematic element of the legal, institutional and policy framework as well as forest benefits generated in secondary production and trade were explicitly excluded from FRA 2005. Nevertheless, the results provide a global picture of key trends with respect to the management and use of forest resources. It should be seen as one illustration of progress, or lack of progress, towards sustainable forest management.

Forest or poverty perspective?

The illustration of trends in relation to both forest area and rural poor population provides an additional example for discussion and further analyses. It is an attempt to combine subregional trends for all studied thematic elements of sustainable forest management and to relate them to the relative proportion of the global forest area and the number of rural poor people in each subregion. The number of observed positive and negative trends should be seen as an illustration rather than an absolute result. Still, the presentation provides some insight into the very different conclusions that may be reached. Forest resources assessments have often had a relatively restricted approach, emphasizing results related to measures of forest area. However, the broad objective of sustainable forest management, addressing also sustainable development, would suggest that a variety of analytical perspectives be included that encompass socio-cultural, economic and environmental dimensions of forest resources, their management and uses.

Is there progress towards sustainable forest management?

Given the complexity of this question, the answer cannot be a definitive one. There are many good signs and positive trends, but many negative trends remain. While intensive forest plantation and conservation efforts are on the rise, primary forests continue to become degraded or converted to agriculture at alarming rates. As the analyses above illustrate, the answer also depends on the scale and perspective applied.

Chapter 9
Conclusions

FAO has been coordinating global forest resources assessments since 1946. FRA 2005 is the latest and the most comprehensive assessment to date. Information was collected and analysed from 229 countries and territories for three points in time: 1990, 2000 and 2005. Some 40 variables were included, related to the extent, condition, uses and values of forests and other wooded land.

More than 800 people were involved in the FRA 2005 process, including 172 officially nominated national correspondents, their colleagues, an advisory group, international experts, FAO and UNECE staff, consultants and volunteers from around the world. The outcome of this process is better data, a more transparent reporting process and enhanced national capacity in data analysis and reporting.

This section offers general conclusions for FRA 2005 and highlights considerations for future assessments. It does not repeat detailed findings from previous chapters.

PROGRESS TOWARDS SUSTAINABLE FOREST MANAGEMENT

It is clear from the findings of FRA 2005 that there is mixed progress towards sustainable forest management. Using the thematic elements of this management approach as a framework for FRA 2005 has helped broaden the perspective on global forest resources. In addition to providing information on traditional variables such forest area change and deforestation, i.e. the first thematic element of sustainable forest management, FRA 2005 also includes detailed information on key aspects related to biological diversity, forest health and the productive, protective and socio-economic functions of forests, other wooded land and trees outside forests. The result is a much richer review of key trends in forest resources, their functions and benefits. While many trends remain alarming, it is clear that there are also many positive developments regarding forest resources, their management and uses.

When interpreting the findings from FRA 2005, the scale is crucial. At the global level, the world's forest resources appear to be doing fine (Chapter 8, Table 8.2): changes in most variables are relatively small and the large changes indicate more positive than negative trends. However, this picture changes dramatically when the information is broken down by region and subregion (Tables 8.3–8.9 in the same chapter), revealing considerable differences, with alarming trends in several tropical subregions. It is likely that the variations are even greater at national and subnational scales, but it is not the purpose of this report to draw conclusions at these levels.

All regions and subregions display a mix of positive and negative trends, which makes it difficult to say anything definite about the level of progress towards sustainable forest management. The FRA process and this report do not venture into weighting the studied variables, i.e. stating that one trend is more important than another. Nor is an assessment of progress towards sustainable forest management at the country level included. That would be the task of further analyses, for example, as part of national forest programmes or other policy or planning processes. The report does, however, illustrate that conclusions and the focus on key developments shift according to the perspective, for example viewed from the size of the forest estate or from the number of rural poor people. This poses the question of where and how emphases of future efforts to achieve sustainable forest management should be applied, which will hopefully stimulate a healthy debate and further analyses of the performance of the forestry sector.

Alarming trends

The global forest resources assessment process delivers observed trends of key parameters related to forestry and the forest ecosystem. The FRA process does not include scenario development. By contrast, the FAO-led forestry outlook studies, the Millennium Ecosystem Assessment (MEA, 2005) and the *Global environmental outlook 3* (UNEP, 2002) are examples of processes that make good use of the knowledge generated by the FRA process to predict the future. Yet the FRA 2005 findings provide a number of observations that are alarming in the light of aspirations for sustainable forest management:

- Deforestation continues at an alarming rate in several regions and countries and shows no sign of slowing down at the global level.
- The area of primary forest is decreasing by about 6 million hectares each year. Partly due to deforestation, partly due to selective logging and other human activities, which leave visible signs of human impact and thus transform the forest into a modified natural forest in the FRA 2005 classification system.
- In some regions, the area of forest adversely affected by forest fires, insects and diseases is increasing.
- The value of wood removals in increasing, but less than the inflation rate. Being one of the main sources of income for the forest owner, this may have negative impacts on future investments in forest conservation and management.
- The level of employment in forest management and conservation is decreasing in some regions and at the global level.

Although not all of the above trends are universally perceived as negative (a decrease in the value of wood removals may indicate that functions other than wood production are given priority or that production costs have decreased over time), considerable efforts will be needed to address a number of alarming trends in order to progress towards sustainable forest management in all countries and regions. National forest programmes offer a potential vehicle for discussion of issues and agreement on priority actions at the national and subnational level.

Considerations for future assessments

As clearly illustrated in the previous chapter, the assessment of progress towards sustainable forest management depends on the context, the scale and the perspective applied. This should be kept in mind in future assessments.

Efforts should also be made to widely disseminate the results and make use of them in scenario development and outlook studies.

SCOPE AND COVERAGE OF FRA 2005

The scope and coverage of global forest resources assessments have evolved over the past half century, from a timber supply orientation through a strong focus on environmental issues to a broader approach in FRA 2000 (Holmgren and Persson, 2002). FRA 2005 continued this trend by explicitly addressing six of the seven thematic elements of sustainable forest management. Using these elements as the reporting framework for FRA 2005 was an ambitious approach, suggested by the Kotka IV expert consultation (Luhtala and Varjo, 2003) and subsequently endorsed by COFO (FAO, 2003a). However, three and a half years after the Kotka IV meeting, it can be concluded that this reporting framework has been successfully implemented.

A critical first step in the FRA 2005 process was to select and define the global reporting variables. Following a consultative process, including a global consultation with national correspondents to FRA in November 2003 (FAO, 2004a), 15 reporting tables with about 40 variables were defined (FAO, 2004b). The tables and variables were generalized to facilitate reporting from all regions, which by necessity limits the degree of detail and emphasizes the need to consult country-specific classifications

and references for more detailed analyses. At the same time, the reporting tables represented a broader coverage of forest resources parameters than in previous global assessments, including forest designation, forest characteristics, quantity and value of NWFPs, and employment in forestry.

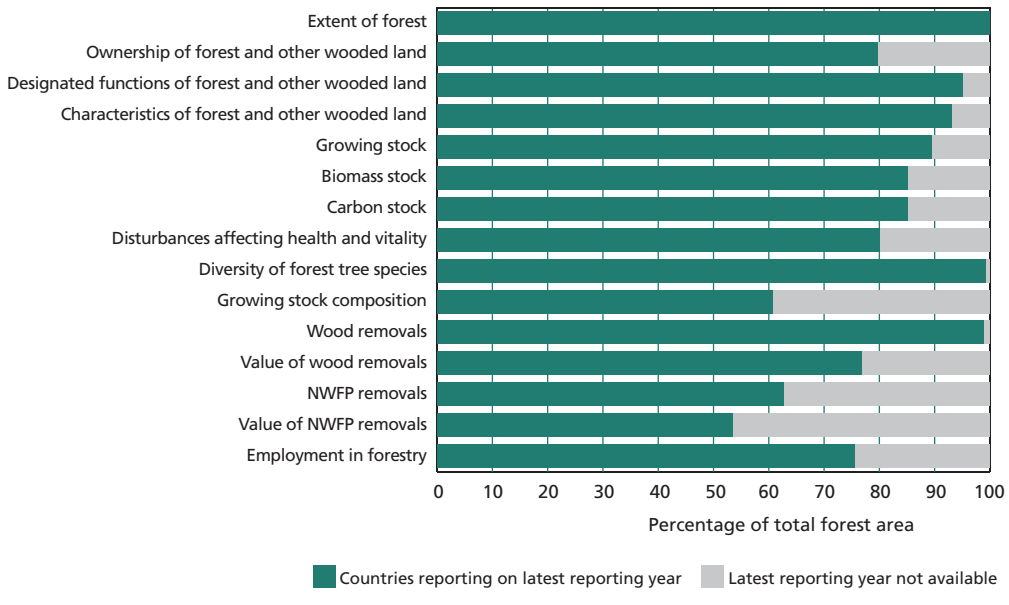
One important consideration in defining the tables was the availability of information at the country level. For example, while more detailed information related to protective functions of forest resources was desirable, it was not considered meaningful to request information if very few countries could respond. On the other hand, certain parameters, including NWFP values and forest fire occurrence, were considered important enough to include even if the response frequency were low. The tables represent a compromise between information availability and the objective of reporting on each of the thematic elements of sustainable forest management. Overall, the response frequency was very good, with nine tables having information for more than 80 percent of the global forest area, and all tables having more than 50 percent coverage (Figure 9.1).

However, the conclusion regarding poor information availability for FRA 2000 is still valid: most developing countries had difficulty reporting because their national monitoring systems are not adequate – neither for international reporting nor for domestic needs. And data quality is an issue, as illustrated in Table 2 in Annex 3, which provides indications of the date of data sources and the methodologies used to estimate key parameters.

To address the issue of data availability and quality, FAO has developed a programme to support national forest assessments (FAO, 2005g), and results from efforts over the last five years are visible in a number of country reports to FRA 2005. Easier access to satellite imagery and some recent national inventories have also resulted in updated information on forest area in many countries. The area-weighted average year for the latest data on forest area is thus 2000 for FRA 2005, compared with 1990 for FRA 2000. Nevertheless, information gaps on most other variables remain wide in many countries, including major forest countries.

The tables containing data on 'designation' and 'characteristics' of forests contained new variables that were not previously defined in FRA. The forest designation table

FIGURE 9.1
Information availability – reporting tables in relation to global forest area


Extent of forest
Ownership of forest and other wooded land
Designated functions of forest and other wooded land
Characteristics of forest and other wooded land
Growing stock
Biomass stock
Carbon stock
Disturbances affecting health and vitality
Diversity of forest tree species
Growing stock composition
Wood removals
Value of wood removals
NWFP removals
Value of NWFP removals
Employment in forestry
0 10 20 30 40 50 60 70 80 90 100
Percentage of total forest area
Countries reporting on latest reporting year
Latest reporting year not available

replaced a set of variables that had been difficult to reconcile in FRA 2000, i.e. forests in protected areas, area available for wood supply and area with a forest management plan. The designation table addressed the thematic elements of sustainable forest management more directly and did not allow overlaps among the variables included. The characteristics table introduced the concepts of 'modified natural forest' and 'semi-natural forest' to global reporting and subdivided forest plantations into two groups: protective and productive. This provided a more detailed picture of the degree to which forests have been established or impacted by humans. In both cases, countries were at first slightly resistant to the new concepts, as few of them possessed data directly applicable to this classification system, but, as the reporting process came to a close, both new tables had a response rate of above 90 percent of total forest area (Figure 9.1). Further, a wide range of findings in this report could be based on these tables, which would seem to justify the additions. These cases do, however, illustrate the difficulties of introducing new concepts into global reporting.

The experience of linking to related reporting processes and attempting to harmonize overlapping variables was generally good. However, differences in definitions continued to be an issue and some countries communicated that reporting responsibilities in the countries were neither clear nor synchronized, leading to confusion. It was also obvious that the conscious approach to harmonizing reporting might not generate immediate relief for workloads. On the contrary, the initial effort to harmonize and streamline international reporting may be quite labour intensive. While harmonization of reporting is an obvious goal for all stakeholders, it seems that the investment will take time to generate returns.

As mentioned in Chapter 2, no independent remote sensing survey was carried out for FRA 2005 due to lack of resources. Recalling the experience of FRA 2000, it would have been beneficial to verify findings at the regional level with an independent data source and to obtain more detailed information on the dynamics and underlying causes of changes in land use, forest cover and forest characteristics. However, the key survey results from FRA 2000 are still valid. Looking at the changes in forest area for Africa, one might draw the same conclusion as in FRA 2000 – that country reports probably still overestimate forest area loss. The discrepancy is smaller, but still clearly significant (the country reports in FRA 2005 add up to an annual net loss of 4.4 million hectares for Africa in the 1990s, whereas the FRA 2000 remote sensing survey estimated losses at 2.1 million hectares per year (with a standard error of 0.4 million hectares per year)). Poor information availability for Africa can probably explain some of the difference, but the fact remains that forest area loss based on country reporting for FRA 2005 is probably overestimated for Africa for the 1990s.

Considerations for future assessments

- Changes to classification systems or definitions of the current reporting tables should not be made without very good reasons.
- Efforts to streamline reporting and to establish long-term goals between reporting processes that aim to reduce the reporting burden on countries should be sustained.
- Efforts to support national forest assessments and build capacities of developing countries to generate systematic information and knowledge to feed into policy processes and international reporting should be enhanced.
- Resources should be sought to implement a remote sensing survey for FRA 2010 to complement country reporting, along the lines tested in recent years (FAO, 2003d). Such a remote sensing survey should preferably also address broader land-use monitoring aspects.

FRA 2005 PROCESS

The active, direct involvement of countries was a defining characteristic of FRA 2005. Following the recommendation of the Kotka IV expert consultation (Luhtala and Varjo, 2003), FAO invested considerable resources in establishing a network of national correspondents and organizing global and regional meetings to support the reporting process and build capacity. Countries readily provided the expertise and resources needed to participate, and the network currently counts 172 officially nominated national correspondents. In conclusion, while resource demanding, the network of national correspondents was a critical success factor for FRA 2005.

The decision to document the information from each country report in a working paper proved costly in terms of workload. While guidelines were issued in relevant languages, it turned out to be a daunting task: regional focal points in the FRA team helped national correspondents follow each step in the transformation of national data to the FRA 2005 reporting tables. The efforts involved considerable knowledge-sharing and capacity enhancement on all sides. The proper documentation of all background material, calculations and assumptions will be very valuable for the next global assessment, and is likely to reduce the workload considerably. The turnover of staff in countries and at FAO requires that procedures are in place to secure institutional memory between assessments.

There are many implicit linkages between the FRA process and other international reporting processes, for example the criteria and indicator processes, United Nations conventions, CPF member institutions, Millennium Development Goals monitoring, the MEA and international NGOs. Some of these traditionally make good use of FRA results as baseline information on forest resources. With the current improvements in country participation, quality control and broadened scope, the relevance of FRA information is likely to increase. However, there may be information needs regarding forests that are not currently covered by FRA, but that could be included if linkages with international processes and bodies were made more explicit.

Considerations for future assessments

- The network of FRA national correspondents should be sustained and efforts made to enhance collaboration with other reporting processes at the national level.
- More explicit collaboration with international processes and institutions should be sought in order to streamline reporting efforts. This might include more active sharing of information, joint information requests, or other forms of collaboration. In particular, the planned reporting to MCPFE, ITTO and the Convention on Biological Diversity (CBD) within the next five years may present an opportunity for such closer collaboration in the next FRA.
- Building on the experience of the high workloads involved in the development of country reports, the option of online reporting/updating by countries should be explored.
- The possibility and eventual advantages of including agricultural aspects in FRA, as they relate to forests and forestry, should be considered. This might be done as part of an independent remote sensing survey of forests and land use, or it might be part of regular country reporting.
- It is suggested that 1990 and 2000 be kept as reference years in the next assessment also, in order to deepen the understanding of key forestry trends.

CONCLUDING REMARKS

FRA 2005 is the most comprehensive assessment to date, in terms of both the content and the number of contributors. It tells us that forests cover 30 percent of the land area of planet Earth. They range from boreal and temperate forests to arid woodlands and

tropical moist forests. And from undisturbed primary forests to forests managed and used for a variety of purposes.

FRA 2005 also tells us that deforestation continues at an alarmingly high rate, but that the net loss of forest area is slowing down thanks to forest planting, landscape restoration and natural expansion of forests on abandoned land.

Forests are increasingly being conserved and managed for multiple uses and values, and play a crucial role in climate change mitigation and in the conservation of biodiversity and of soil and water resources. If managed sustainably, forests also contribute significantly to local and national economies and to the well-being of current and future generations.

By providing new information on forest area change – one of the 48 indicators of the Millennium Development Goals – FRA 2005 allows us to gauge the important role of the world's forest resources in meeting the targets set for reducing poverty and ensuring a sustainable global environment.

By also providing data on carbon, biological diversity, forest contributions to national economies and many more variables, this comprehensive assessment aims to support decision-making for policies and programmes in forestry and sustainable development at all levels.

NEXT STEPS

An in-depth evaluation of FRA 2005 will be carried out in early 2006. Readers are encouraged to contribute to this exercise. FAO will continue to work actively with countries to identify and address information gaps to continuously improve knowledge of forests and forestry. Joint planning for the next global assessment (FRA 2010) will begin in 2006, and an expert consultation (Kotka V) is planned for June 2006 to provide inputs to this next assessment.

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Annex 2

Terms and definitions for the national reporting tables for FRA 2005

FOREST AND OTHER WOODED LAND

Forest

Land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use.

Forest is determined both by the presence of trees and the absence of other predominant land uses. The trees should be able to reach a minimum height of 5 metres (m) in situ. Areas under reforestation that have not yet reached but are expected to reach a canopy cover of 10 percent and a tree height of 5 m are included, as are temporarily unstocked areas, resulting from human intervention or natural causes, which are expected to regenerate.

Includes: areas with bamboo and palms provided that height and canopy cover criteria are met; forest roads, firebreaks and other small open areas; forest in national parks, nature reserves and other protected areas such as those of specific scientific, historical, cultural or spiritual interest; windbreaks, shelterbelts and corridors of trees with an area of more than 0.5 ha and width of more than 20 m; plantations primarily used for forestry or protective purposes, such as rubber-wood plantations and cork oak stands.

Excludes: tree stands in agricultural production systems, for example in fruit plantations and agroforestry systems. The term also excludes trees in urban parks and gardens.

Other wooded land

Land not classified as forest, spanning more than 0.5 hectares; with trees higher than 5 m and a canopy cover of 5–10 percent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 percent. It does not include land that is predominantly under agricultural or urban land use.

Other land

All land that is not classified as forest or other wooded land.
Includes: agricultural land, meadows and pastures, built-up areas, barren land, etc.; areas classified under the subcategory 'other land with tree cover'.

Other land with tree cover

Land classified as other land, spanning more than 0.5 hectares with a canopy cover of more than 10 percent of trees able to reach a height of 5 m at maturity.

Includes: groups of trees and scattered trees in agricultural landscapes, parks, gardens and around buildings, provided that the area, height and canopy cover criteria are met; includes tree plantations established mainly for other purposes than wood, such as fruit orchards.

LAND AREA

Land area

Total country area excluding area under inland water bodies.

The definition of inland water bodies generally includes major rivers and lakes.

Validated data in this category are obtained mainly from the United Nations Statistics Division, New York. Possible variations in the data may be due to updating and revisions of the country data and not necessarily to any change of area.

Inland water bodies Inland water bodies generally include major rivers, lakes and water reservoirs.

OWNERSHIP

Private ownership Land owned by individuals, families, private cooperatives, corporations, industries, private religious and educational institutions, pension or investment funds and other private institutions.

Private owners may be engaged in agriculture or other occupations including forestry.

Public ownership Land owned by the state (national, state and regional governments) or government-owned institutions or corporations or other public bodies including cities, municipalities and villages.

Other ownership Land that is classified neither as public ownership nor as private ownership.

Includes: land for which ownership is not defined or unknown.

DESIGNATED FUNCTIONS OF FOREST AND OTHER WOODED LAND

Designated functions For the purpose of FRA 2005, the designated function refers to the function or purpose assigned to a piece of land either by legal prescriptions or by decision of the landowner/manager. It applies to land classified as forest and as other wooded land.

Conservation of biodiversity Forest/other wooded land designated for conservation of biological diversity.

Includes, but is not limited to, protected areas.

Multiple purpose Forest/other wooded land designated for any combination of: production of goods, protection of soil and water, conservation of biodiversity and provision of socio-cultural services, and where none of these alone can be considered as being significantly more important than the others.

Primary function A designated function is considered to be primary when it is significantly more important than other functions. This includes areas that are legally or voluntarily set aside for specific purposes.

The category 'multiple purpose' is considered a primary function when legal prescriptions and/or landowner decisions explicitly assign functions that correspond to two or more of the designation categories and where none of these is significantly more important than the others.

Production Forest/other wooded land designated for production and extraction of forest goods, including both wood and non-wood forest products (NWFPs).

Protection of soil and water Forest/other wooded land designated for protection of soil and water.

Social services Forest/other wooded land designated for the provision of social services.

May include: recreation, tourism, education and/or conservation of cultural/spiritual sites.

Total area with function Total area where a specific function has been designated, regardless of whether it is primary or not.

The designation categories for total area with function are not exclusive. Hence, areas can be counted more than once, for example: areas with multiple purposes as primary function should be counted once for each specific function included in the multiple purposes; areas with a specific designated primary function should be counted more than once if other, less significant, functions have also been designated.

Unknown function Forest/other wooded land for which a specific function has not been designated or where the designated function is unknown.

FOREST CHARACTERISTICS

Modified natural forest/other wooded land Forest/other wooded land of naturally regenerated native species where there are clearly visible indications of human activities.

Includes, but is not limited to: selectively logged-over areas, naturally regenerating areas following agricultural land use, areas recovering from human-induced fires, etc.; areas where it is not possible to distinguish whether the regeneration has been natural or assisted.

Primary forest/ other wooded land Forest/other wooded land of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed.

Includes: areas where collection of NWFPs occurs, provided the human impact is small. Some trees may have been removed.

Productive plantation (in forest/other wooded land) Forest/other wooded land of introduced species and in some cases native species, established through planting or seeding, mainly for production of wood or non-wood goods.

Includes: all stands of introduced species established for production of wood or non-wood goods.

May include: areas of native species characterized by few species, straight tree lines and/or even-aged stands.

Protective plantation (in forest/other wooded land) Forest/other wooded land of native or introduced species, established through planting or seeding mainly for provision of services.

Includes: all stands of introduced species established for provision of environmental services, such as soil and water protection, pest control and conservation of habitats of biological diversity; areas of native species characterized by few species, straight tree lines and even-aged stands.

Semi-natural forest/other wooded land Forest/other wooded land of native species, established through planting, seeding or assisted natural regeneration.

Includes: areas under intensive management where native species are used and deliberate efforts are made to increase/optimize the proportion of desirable species, thus leading to changes in the structure and composition of the forest. Naturally regenerated trees from other species than those planted/seeded may be present.

May include: areas with naturally regenerated trees of introduced species.

Includes: areas under intensive management where deliberate efforts, such as thinning or fertilizing, are made to improve or optimize desirable functions of the forest. These efforts may lead to changes in the structure and composition of the forest.

GROWING STOCK

Growing stock Volume over bark of all living trees more than X cm in diameter at breast height (DBH). Includes the stem from ground level or stump height up to a top diameter of Y cm, and may also include branches to a minimum diameter of W cm.

The diameter is measured at 30 cm above the end of the buttresses if these are higher than 1 m.

Includes: windfallen living trees.

Excludes: Smaller branches, twigs, foliage, flowers, seeds and roots.

Commercial growing stock

The part of the growing stock that is considered as commercial or potentially commercial under current market conditions (and with a diameter at breast height of Z cm or more).

Includes: all commercial and potentially commercial (merchantable) species for domestic and international markets.

Excludes: growing stock on areas where legal, economic or other specific restrictions prevent felling and removal of wood.

When most species are commercial, i.e. in the temperate and boreal zone, the commercial growing stock can be close to the total growing stock. On the other hand, when only a small fraction of all species are merchantable, it can be considerably smaller.

BIOMASS

Biomass

Organic material both above ground and below ground, and both living and dead, e.g., trees, crops, grasses, tree litter, roots, etc. Biomass includes the pool definition for above- and below-ground biomass.

Above-ground biomass

All living biomass above the soil, including stem, stump, branches, bark, seeds and foliage.

Where the forest understorey is a relatively small component of the above-ground biomass, it is acceptable to exclude it, provided this is done in a consistent manner throughout the inventory time series.

Below-ground biomass

All living biomass of live roots. Fine roots of less than (suggested) 2 mm diameter are sometimes excluded because these often cannot be distinguished empirically from soil organic matter or litter.

May include: the below-ground part of the stump.

Dead-wood biomass

All non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.

CARBON STOCK

Carbon stock

The quantity of carbon in a 'pool', meaning a reservoir or system that has the capacity to accumulate or release carbon.

Examples of carbon pools are: living biomass (including above- and below-ground biomass); dead organic matter (including dead wood and litter); soils (soil organic matter). The units are mass.

Carbon in above-ground biomass

Carbon in all living biomass above the soil, including stems, stump, branches, bark, seeds and foliage.

Where the forest understorey is a relatively small component of the above-ground biomass carbon pool, it is acceptable to exclude it, provided this is done in a consistent manner throughout the inventory time series.

Carbon in below-ground biomass

Carbon in all living biomass of live roots.

Includes: the below-ground part of the stump.

Excludes: fine roots of less than 2 mm diameter because these often cannot be distinguished empirically from soil organic matter or litter.

Carbon in dead-wood biomass

Carbon in all non-living woody biomass not contained in the litter, either standing, lying on the ground or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.

Carbon in litter Carbon in all non-living biomass with a diameter less than a minimum diameter chosen by the country, in various states of decomposition above the mineral or organic soil. This includes the litter, fumic and humic layers.

Includes: live fine roots of less than 2 mm (or other value chosen by the country as diameter limit for below-ground biomass), where they cannot be empirically distinguished from the litter.

Soil carbon Organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series.

Includes: live fine roots of less than 2 mm (or other value chosen by the country as diameter limit for below-ground biomass) with soil organic matter, where they cannot be distinguished from it empirically.

DISTURBANCES AFFECTING FOREST HEALTH AND VITALITY

Disturbances (affecting forest health and vitality) A disturbance is defined as "an environmental fluctuation and destructive event that disturb forest health, structure, and/or change resources or physical environment at any given spatial or temporal scale". Disturbances that affect health and vitality include biotic agents, such as insects and diseases, and abiotic agents, such as fire, pollution and extreme weather conditions (White and Pickett, 1985).

Disturbance by diseases Disturbance caused by diseases attributable to pathogens, such as bacteria, fungi, phytoplasmas or viruses.

Disturbance by fire Disturbance caused by wildfire, regardless of whether it broke out inside or outside the forest/other wooded land.

A wildfire is any unplanned and uncontrolled wildland fire that, regardless of ignition source, may require suppression response.

Disturbance by insects Disturbance caused by insect pests that are detrimental to tree health.

Other disturbance Disturbance caused by factors other than fire, insects or diseases.

May include: areas affected by drought, flooding, windfalls, acid rain, etc.

THREATENED SPECIES

Endangered species A taxon is endangered when the best available evidence indicates that it meets any of the criteria A to E specified for the endangered category of the IUCN red list and it is therefore considered to be facing a very high risk of extinction in the wild (IUCN, 2000).

Critically endangered species A taxon is critically endangered when the best available evidence indicates that it meets any of the criteria A to E for the critically endangered category of the IUCN red list and is therefore considered to be facing an extremely high risk of extinction in the wild.

Vulnerable species A taxon is vulnerable when the best available evidence indicates that it meets any of the criteria A to E for the vulnerable category of the IUCN red list and is therefore considered to be facing a high risk of extinction in the wild.

Native species A native species is one which naturally exists at a given location or in a particular ecosystem, i.e. it has not been moved there by humans (CBD, 2002, p.154).

The term native species is synonymous with indigenous species.

WOOD AND NWFP REMOVAL

Wood removal

The wood removed (volume of round wood over bark) for production of goods and services other than energy production (woodfuel).

The term removal differs from fellings as it excludes felled trees left in the forest.

Includes: removal from fellings in an earlier period and from trees killed or damaged by natural causes; removal by local people or owners for their own use.

Woodfuel removal

The wood removed for energy production purposes, regardless of whether for industrial, commercial or domestic use.

Includes: wood collected or removed directly from forest or other wooded land for energy purposes only and excludes woodfuel produced as a by-product or residual matter from the industrial processing of round wood; removal from fellings in an earlier period and from trees killed or damaged by natural causes; removal by local people or owners for their own use.

Non-wood forest product removal

Annual removal of an NWFP from forest and other wooded land.

VALUE OF WOOD AND NWFP REMOVAL

Value of wood removal

Value of the wood removed for production of goods and services other than energy production (woodfuel).

The value to be reported refers to the market value at the site of removal. Where values are obtained from a point further down the production chain, transport costs and possible handling and/or processing costs should be deducted. If the wood is removed for subsistence use, the value should be calculated based on local market price. The value should be reported excluding taxes.

Value of woodfuel removal

Value of the wood removed for energy production purposes, regardless of whether for industrial, commercial or domestic use.

The value to be reported refers to the market value at the site of removal. Where values are obtained from a point further down the production chain, transport costs and possible handling and/or processing costs should be deducted. If the wood is removed for subsistence use, the value should be calculated based on local market price. The value should be reported excluding taxes.

Value of non-wood forest product removal

Value of the annual removal of primary NWFPs.

The value to be reported refers to the market value at the site of removal. Values are obtained from a point further down the production chain, transport costs and possible handling and/or processing costs should be deducted. If the NWFP is removed for subsistence use, the value should be calculated based on local market price. The value should be reported excluding taxes.

EMPLOYMENT

Employment

Any type of work performed or services rendered under a contract of hire, written or oral, in exchange for wage or salary, in cash or in kind (based on definitions by ILO and the Employment Security Commission).

Employment related to the primary production of goods

Employment in activities related to the primary production of goods, such as industrial roundwood, woodfuel and NWFPs.

Includes: employment in direct productive activities such as planting, seeding, silviculture, logging, terrain transport, collection of NWFPs, including administrative and supervisory staff in companies that are engaged in such activities; employment in direct supporting activities to production of goods, such as plant production in nurseries, etc.; contractors working in activities as mentioned under the first item above, even if these are legally considered self-employed; employment in direct supervision of these activities by private and/or public entities.

Employment related to the provision of services

Employment in activities directly related to the provision of forest and woodland services.

Includes: employment in activities such as forest-related ecotourism, establishment and management of protective plantations, guarding of national parks, etc., regardless of whether carried out by private or public entities; employment in direct supervision of these activities by private and/or public entities.

Employment in unspecified forestry activities

Employment in unspecified forestry activities related to the primary production of goods and/or the provision of forest services.

Annex 3
Global tables

NOTES

Country nomenclature and regional groups used in the tables

The country names used in these tables follow standard UN practice regarding nomenclature and alphabetical listing of countries. The regional groups represent FAO's standardized regional breakdown of the world according to geographical criteria.

Totals

Numbers may not tally because of rounding. Global and regional totals are omitted in those cases where the sum of the reported values would not give a correct estimate because of incomplete data sets.

Abbreviations

n.s.	=	not significant, indicating a very small value
-	=	not available
n.ap.	=	not applicable
o.b.	=	over bark

CONTENTS

1. Basic data on countries and areas 178
2. Information status on area of forest, growing stock and biomass 184
3. Extent of forest and other wooded land 2005 190
4. Change in extent of forest and other wooded land 1990-2005 196
5. Ownership of forest and other wooded land 2000 202
6. Designated functions of forest – primary function 2005 208
7. Designated functions of forest – total area with function 2005 214
8. Characteristics of forest and other wooded land 2005 220
9. Change in extent of primary forest 1990-2005 232
10. Change in extent of forest plantations 1990-2005 238
11. Growing stock in forest and other wooded land 2005 244
12. Annual change in growing stock 1990-2005 250
13. Biomass stock in forest and other wooded land 2005 256
14. Carbon stock in forest and other wooded land 2005 262
15. Disturbances affecting forest and other wooded land 2000 268
16. Composition of growing stock and diversity of tree species 2000 274
17. Removals of wood products 1990-2005 280
18. Removals of non-wood forest products 2005 286
19. Value of wood and non-wood forest products removals 2005 298
20. Employment in forestry 1990 and 2000 304

TABLE 1
Basic data on countries and areas

Country/area	Land area[a] (1 000 ha)	Population 2004[b]				GDP 2004[b]	
		Total (1 000)	Density (Population/km²)	Annual growth rate (%)	Rural (% of total)	Per capita (US$)	Annual growth rate (%)
Angola	124 670	13 963	11.2	3.2	63.6	887	11.2
Botswana	56 673	1 727	3.1	0.3	48.0	3 684	4.6
British Indian Ocean Territory	8	1	15.0				
Comoros	186	614	275.6	2.4	64.4	361	1.9
Kenya	56 914	32 447	57.0	1.7	59.5	343	2.1
Lesotho	3 035	1 809	59.6	0.9	81.9	540	3.1
Madagascar	58 154	17 332	29.8	2.6	73.2	239	5.3
Malawi	9 408	11 182	118.9	2.0	83.3	165	3.8
Mauritius	203	1 234	608.0	1.0	56.5	4 289	4.2
Mayotte	37	172	459.9				
Mozambique	78 409	19 129	24.4	1.8	63.2	270	7.8
Namibia	82 329	2 033	2.5	0.9	67.0	1 905	4.2
Réunion	250	777	310.8				
Seychelles	45	85	188.2	1.3	49.9	6 573	-2.0
South Africa	121 447	45 584	37.5		42.6	3 307	3.7
Swaziland	1 720	1 120	65.1	1.3	76.3	1 356	2.1
Uganda	19 710	25 920	131.5	2.5	87.7	285	5.7
United Republic of Tanzania	88 359	36 571	41.4	1.9	63.6	322	6.3
Zambia	74 339	10 547	14.2	1.4	63.8	366	4.7
Zimbabwe	38 685	13 151	34.0	0.4	64.6		
Total Eastern and Southern Africa	**814 581**	**235 398**					
Algeria	238 174	32 373	13.6	1.7	40.6	1 981	5.2
Burkina Faso	27 360	12 387	45.3	2.3	81.8	257	3.9
Chad	125 920	8 823	7.0	2.8	74.6	277	31.0
Djibouti	2 318	716	30.9	1.4	15.9	861	3.0
Egypt	99 545	68 738	69.1	1.7	57.8	1 663	4.3
Eritrea	10 100	4 477	44.3	2.0	79.6	163	1.8
Ethiopia	100 000	69 961	70.0	1.9	84.1	113	13.4
Libyan Arab Jamahiriya	175 954	5 674	3.2	2.1	13.4	7 483	4.5
Mali	122 019	11 937	9.8	2.4	67.0	260	2.2
Mauritania	102 522	2 906	2.8	2.0	37.0	396	6.6
Morocco	44 630	30 586	68.5	1.6	41.9	1 302	3.5
Niger	126 670	12 095	9.6	2.8	77.3	174	0.9
Somalia	62 734	9 938	15.8	3.2	64.6		
Sudan	237 600	34 356	14.5	2.4	60.2	448	6.0
Tunisia	15 536	10 012	64.4	1.2	35.9	2 315	5.8
Western Sahara	26 600	274	1.0				
Total Northern Africa	**1 517 682**	**315 253**					
Benin	11 062	6 890	62.3	2.5	54.7	389	2.7
Burundi	2 568	7 343	285.9	1.9	89.7	104	5.5
Cameroon	46 540	16 400	35.2	1.9	47.9	651	4.8
Cape Verde	403	481	119.4	2.5	43.3	1 328	5.5
Central African Republic	62 298	3 947	6.3	1.7	56.8	232	0.9
Congo	34 150	3 855	11.3	2.6	46.1	956	4.0
Côte d'Ivoire	31 800	17 142	53.9	1.8	54.6	583	-2.3

TABLE 1
Basic data on countries and areas

Country/area	Land area[a] *(1 000 ha)*	Population 2004[b]				GDP 2004[b]	
		Total *(1 000)*	Density *(Population/km²)*	Annual growth rate *(%)*	Rural *(% of total)*	Per capita *(US$)*	Annual growth rate *(%)*
Democratic Republic of the Congo	226 705	54 775	24.2	3.0	67.7	89	6.3
Equatorial Guinea	2 805	506	18.0	2.4	51.0	3 989	10.0
Gabon	25 767	1 374	5.3	2.2	15.6	3 859	2.0
Gambia	1 000	1 449	144.9	1.9	73.9	344	8.3
Ghana	22 754	21 053	92.5	1.8	54.2	285	5.2
Guinea	24 572	8 073	32.9	2.1	64.3	433	2.6
Guinea-Bissau	2 812	1 533	54.5	2.9	65.2	137	4.3
Liberia	9 632	3 449	35.8	2.2	52.7	120	2.0
Nigeria	91 077	139 824	153.5	2.4	52.5	361	3.6
Rwanda	2 467	8 412	341.0	2.8	79.9	263	3.7
Saint Helena	31	7	24.1				
Sao Tome and Principe	96	161	167.3	2.0	62.1	342	4.5
Senegal	19 253	10 455	54.3	2.1	49.7	504	6.0
Sierra Leone	7 162	5 436	75.9	1.9	60.5	206	7.4
Togo	5 439	4 966	91.3	2.1	64.3	294	3.0
Total Western and Central Africa	**630 393**	**317 531**					
Total Africa	**2 962 656**	**868 182**					
China	932 742	1 326 544	142.2	0.6	60.4	1 162	9.5
Democratic People's Republic of Korea	12 041	22 745	188.9	0.6	38.6		
Japan	36 450	127 764	350.5	0.2	34.4	39 195	2.7
Mongolia	156 650	2 515	1.6	1.4	43.1	462	10.6
Republic of Korea	9 873	48 142	487.6	0.5	19.5	12 743	4.6
Total East Asia	**1 147 756**	**1 527 710**					
Bangladesh	13 017	140 494	1 079.3	1.7	75.4	396	5.5
Bhutan	4 700	896	19.1	2.5	91.2	695	4.9
Brunei Darussalam	527	361	68.6	1.4	23.2		
Cambodia	17 652	13 630	77.2	1.7	80.8	328	6.0
India	297 319	1 079 721	363.2	1.4	71.5	538	6.9
Indonesia	181 157	217 588	120.1	1.4	53.3	906	5.1
Lao People's Democratic Republic	23 080	5 792	25.1	2.3	78.8	372	6.0
Malaysia	32 855	25 209	76.7	1.7	35.6	4 221	7.1
Maldives	30	300	998.4	2.2	70.7	2 693	8.8
Myanmar	65 755	49 910	75.9	1.1	70.0		
Nepal	14 300	25 190	176.2	2.1	84.6	245	3.7
Pakistan	77 088	152 061	197.3	2.4	65.5	566	6.4
Philippines	29 817	82 987	278.3	1.8	38.2	1 079	6.2
Singapore	67	4 335	6 470.2	2.0	0.0	23 636	8.4
Sri Lanka	6 463	19 444	300.9	1.1	79.0	965	6.0
Thailand	51 089	62 387	122.1	0.6	67.8	2 399	6.1
Timor-Leste	1 487	925	62.2	5.3	92.3	355	1.8
Viet Nam	32 549	82 162	252.4	1.0	73.8	500	7.5
Total South and Southeast Asia	**848 952**	**1 963 392**					
Afghanistan	65 209	17 685	45.3		76.2		7.5
Armenia	2 820	3 050	108.1	-0.2	35.7	975	10.1

TABLE 1
Basic data on countries and areas

Country/area	Land area[a] (1 000 ha)	Population 2004[b]				GDP 2004[b]	
		Total (1 000)	Density (Population/km²)	Annual growth rate (%)	Rural (% of total)	Per capita (US$)	Annual growth rate (%)
Azerbaijan	8 260	8 280	100.2	0.6	50.0	957	11.2
Bahrain	71	725	1 021.7	1.9	9.9		
Cyprus	924	776	83.9	0.7	30.7	13 245	3.7
Georgia	6 949	4 521	65.1	-1.0	48.3	897	8.5
Iran (Islamic Republic of)	163 620	66 928	40.9	1.3	32.7	1 812	6.5
Iraq	43 737	24 700	57.8	2.2	33.0		
Israel	2 171	6 798	313.1	1.6	8.3	17 752	4.3
Jordan	8 893	5 440	61.2	2.5	20.8	1 908	7.5
Kazakhstan	269 970	14 958	5.5	0.5	44.1	1 822	9.4
Kuwait	1 782	2 460	138.0	2.6	3.7		
Kyrgyzstan	19 180	5 099	26.6	0.9	66.1	324	7.1
Lebanon	1 023	4 554	445.2	1.2	12.3	4 358	6.3
Occupied Palestinian Territory	602	3 508	564.0	4.1			
Oman	30 950	2 659	8.6	2.3	21.9		
Qatar	1 100	637	57.9	2.1	7.8		
Saudi Arabia	214 969	23 215	10.8	3.0	12.0	9 259	5.2
Syrian Arab Republic	18 378	17 783	96.8	2.3	49.8	1 150	3.6
Tajikistan	14 060	6 430	45.7	0.7	75.5	226	10.6
Turkey	76 963	71 727	93.2	1.4	33.2	3 197	8.9
Turkmenistan	46 993	4 931	10.5	1.4	54.4	1 142	17.0
United Arab Emirates	8 360	4 284	51.2		14.7		
Uzbekistan	41 424	25 930	62.6	1.3	63.5	645	7.7
Yemen	52 797	19 763	37.4	3.0	74.0	550	2.7
Total Western and Central Asia	**1 101 205**	**346 841**					
Total Asia	**3 097 913**	**3 837 943**					
Albania	2 740	3 188	116.4	0.6	55.6	1 470	6.2
Andorra	48	66	141.0				
Austria	8 273	8 115	98.1	0.3	34.2	24 674	2.2
Belarus	20 748	9 832	47.4	-0.5	28.7	1 516	11.0
Belgium	3 028	10 405	344.2	0.3	2.8	23 134	2.9
Bosnia and Herzegovina	5 120	3 836	74.9	0.0	55.2	1 384	4.7
Bulgaria	11 063	7 780	70.3	-0.6	29.9	1 951	5.6
Channel Islands	19	149	745.0	0.0	69.5		
Croatia	5 592	4 508	80.6	0.1	40.6	4 857	3.7
Czech Republic	7 728	10 183	131.8	-0.2	25.6	6 148	4.0
Denmark	4 243	5 397	127.2	0.2	14.5	30 930	2.4
Estonia	4 239	1 345	31.7	-0.6	30.5	5 170	6.2
Faeroe Islands	140	48	34.3				
Finland	30 459	5 215	17.1	0.1	39.1	25 107	3.7
France	55 010	59 991	109.1	0.4	23.5	23 157	2.3
Germany	34 895	82 631	236.8	0.1	11.7	23 209	1.6
Gibraltar	1	28	2 788.4				
Greece	12 890	11 075	85.9	0.4	38.9	11 885	4.2
Holy See		1					
Hungary	9 210	10 072	109.4	-0.6	34.5	5 339	4.0
Iceland	10 025	290	2.9	0.4	7.1	32 449	5.2

TABLE 1
Basic data on countries and areas

Country/area	Land area[a] *(1 000 ha)*	Population 2004[b]				GDP 2004[b]	
		Total *(1 000)*	Density *(Population/km²)*	Annual growth rate *(%)*	Rural *(% of total)*	Per capita *(US$)*	Annual growth rate *(%)*
Ireland	6 889	4 019	58.3	0.6	39.9	29 118	4.9
Isle of Man	57	77	134.6				
Italy	29 411	57 573	195.8	-0.1	32.5	19 344	1.2
Latvia	6 205	2 303	37.1	-0.8	33.9	4 502	8.5
Liechtenstein	16	34	212.5				
Lithuania	6 268	3 439	54.9	-0.4	33.3	4 398	6.7
Luxembourg	259	450	174.0	0.5	7.9	47 926	4.5
Malta	32	401	1 253.1	0.5	8.1	9 508	1.4
Monaco	2	33	16 923.1				
Netherlands	3 388	16 250	479.6	0.2	33.7	23 255	1.4
Norway	30 625	4 582	15.0	0.4	20.5	39 198	2.9
Poland	30 629	38 160	124.6	-0.1	38.1	4 885	5.3
Portugal	9 150	10 436	114.1	0.7	44.9	10 395	1.0
Republic of Moldova	3 288	4 218	128.3	-0.5	53.8	398	7.3
Romania	22 987	21 858	95.1	-0.3	45.3	2 115	8.3
Russian Federation	1 688 850	142 814	8.5	-0.4	26.7	2 302	7.2
San Marino	6	28	462.8				
Serbia and Montenegro	10 200	8 152	79.9	-0.7	47.8	1 272	7.2
Slovakia	4 808	5 390	110.5	0.0	42.3	4 488	5.5
Slovenia	2 012	1 995	99.2	0.0	49.2	10 871	4.6
Spain	49 944	41 286	82.7	0.5	23.4	15 079	3.1
Sweden	41 162	8 985	21.8	0.3	16.6	28 912	3.6
Switzerland	3 955	7 382	186.7	0.4	32.5	34 190	1.7
The former Yugoslav Republic of Macedonia	2 543	2 062	81.1	0.6	40.4	1 772	2.5
Ukraine	57 935	48 008	82.9	-0.7	32.7	917	12.1
United Kingdom	24 088	59 405	246.6	0.1	10.8	26 506	3.1
Total Europe	**2 260 180**	**723 495**					
Anguilla	8	13	172.1				
Antigua and Barbuda	44	80	181.8	2.7	61.9	9 608	4.1
Aruba	19	99	521.1				
Bahamas	1 001	320	32.0	0.8	10.3		
Barbados	43	272	632.1	0.4	47.7		
Bermuda	5	64	1 280.0	0.3	0.0		
British Virgin Islands	15	23	151.0				
Cayman Islands	26	44	169.2		57.3		
Cuba	10 982	11 365	103.5	0.3	24.2		
Dominica	75	71	95.3	0.4	27.6	3 534	2.0
Dominican Republic	4 838	8 861	183.2	1.4	40.3	2 450	2.0
Grenada	34	106	310.9	1.1	58.6	3 798	-2.8
Guadeloupe	169	449	265.5				
Haiti	2 756	8 592	311.8	1.8	61.9	437	-3.8
Jamaica	1 083	2 665	246.1	0.8	47.8	2 975	2.0
Martinique	106	433	408.4				
Montserrat	10	9	93.4				
Netherlands Antilles	80	222	277.5	0.8	30.1		

TABLE 1
Basic data on countries and areas

Country/area	Land area[a] (1 000 ha)	Population 2004[b]				GDP 2004[b]	
		Total (1 000)	Density (Population/km²)	Annual growth rate (%)	Rural (% of total)	Per capita (US$)	Annual growth rate (%)
Puerto Rico	887	3 929	442.9	0.8	3.1		
Saint Kitts and Nevis	36	47	130.5	0.6	68.0	7 427	4.0
Saint Lucia	61	164	268.3	1.9	69.1	4 276	3.5
Saint Vincent and the Grenadines	39	108	277.7	-0.8	40.7	3 382	4.0
Trinidad and Tobago	513	1 323	258.0	0.8	24.2	7 921	6.2
Turks and Caicos Islands	43	21	47.8				
United States Virgin Islands	34	113	332.8	1.4	6.2		
Total Caribbean	**22 907**	**39 393**					
Belize	2 280	283	12.4	3.2	51.5	3 669	4.2
Costa Rica	5 106	4 061	79.5	1.4	38.8	4 534	4.2
El Salvador	2 072	6 658	321.3	1.9	40.2	2 124	1.7
Guatemala	10 843	12 628	116.5	2.6	53.3	1 676	2.7
Honduras	11 189	7 141	63.8	2.5	54.0	952	4.6
Nicaragua	12 140	5 604	46.2	2.2	42.3	778	3.7
Panama	7 443	3 028	40.7	1.5	42.5	4 373	6.2
Total Central America	**51 073**	**39 403**					
Canada	922 097	31 902	3.5	0.9	19.2	24 712	2.9
Greenland	41 045	57	0.1	-0.4	17.3		
Mexico	190 869	103 795	54.4	1.5	24.2	5 968	4.4
Saint Pierre and Miquelon	23	7	30.5				
United States of America	915 896	293 507	32.1	0.9	19.6	36 790	4.4
Total North America	**2 069 930**	**429 268**					
Total North and Central America	**2 143 910**	**508 064**					
American Samoa	20	57	285.0				
Australia	768 230	20 120	2.6	1.2	7.7	22 074	3.0
Cook Islands	23	21	93.0				
Fiji	1 827	848	46.4	1.5	47.5	2 232	3.8
French Polynesia	366	246	67.2	1.2	47.9		
Guam	55	164	298.0	1.4	6.2		
Kiribati	73	98	134.0	1.5	51.3	532	1.8
Marshall Islands	18	60	330.9		33.6	1 738	1.5
Micronesia (Federated States of)	70	127	180.6	1.8	70.3	1 745	-3.8
Nauru	2	13	652.4				
New Caledonia	1 828	229	12.5	1.9	38.6		
New Zealand	26 799	4 061	15.2	1.3	14.1	14 984	4.4
Niue	26	2	8.3				
Northern Mariana Islands	46	77	161.4				
Palau	46	20	43.5		31.6	6 360	2.0
Papua New Guinea	45 286	5 625	12.4	2.2	86.8	622	2.8
Pitcairn	4	0					
Samoa	283	179	63.3	0.6	77.6	1 417	3.2
Solomon Islands	2 799	471	16.8	3.1	83.2	621	3.8
Tokelau	1	1	139.2				
Tonga	72	102	141.4	0.3	66.2	1 638	1.6

TABLE 1
Basic data on countries and areas

Country/area	Land area[a] *(1 000 ha)*	Population 2004[b]				GDP 2004[b]	
		Total *(1 000)*	Density *(Population/km²)*	Annual growth rate *(%)*	Rural *(% of total)*	Per capita *(US$)*	Annual growth rate *(%)*
Tuvalu	3	12					
Vanuatu	1 219	215	17.6	2.3	76.7	1 110	3.0
Wallis and Futuna Islands	20	16	80.1				
Total Oceania	**849 116**	**32 764**					
Argentina	273 669	38 226	14.0	0.8	9.7	7 511	9.0
Bolivia	108 438	8 986	8.3	1.9	36.1	1 036	3.6
Brazil	845 942	178 718	21.1	1.2	16.4	3 675	5.2
Chile	74 880	15 956	21.3	1.2	12.7	5 448	6.1
Colombia	103 870	45 300	43.6	1.6	23.1	2 069	4.0
Ecuador	27 684	13 213	47.7	1.6	37.7	1 435	6.6
Falkland Islands	1 217	3	0.2				
French Guiana	8 815	196	2.2				
Guyana	19 685	772	3.9	0.4	62.0	962	1.6
Paraguay	39 730	5 782	14.6	2.4	42.1	1 413	2.9
Peru	128 000	27 547	21.5	1.5	25.8	2 207	5.1
South Georgia and the South Sandwich Islands	409	0					
Suriname	15 600	443	2.8	1.1	23.4	2 388	4.6
Uruguay	17 502	3 399	19.4	0.6	7.3	5 826	12.3
Venezuela (Bolivarian Republic of)	88 205	26 127	29.6	1.8	12.1	4 575	17.3
Total South America	**1 753 646**	**364 668**					
WORLD[c]	**13 067 421**	**6 335 116**					

[a] Total area of the country excluding areas under inland water bodies. The figures are from FAOSTAT (FAO, 2005a) where available, otherwise from CIA (2005).

[b] From World Bank (2005).

[c] World totals correspond to the sum of the reporting units. About 35 million hectares of land in Antarctica, some Arctic and Antarctic islands and some other small islands are not included. See FAO (2005c) for more information on these areas.

TABLE 2
Information status on area of forest, growing stock and biomass

Country/area	Most recent data on forest area[a]			Forest area time series[b]	Forest area projection[c]	Growing stock time series[b]	Biomass estimation[d]
	Field survey/ mapping	Remote sensing	Expert estimate				
Angola	1970		1983	MLT	LEM	SIN	GPG
Botswana		1990	2005	SIN	DEF	SIN	EXP
British Indian Ocean Territory			1990	SIN	ANC	-	-
Comoros		1984		MLT	LEM	MLT	GPG
Kenya			2000	MLT	MOD	SIN	GPG/EXP
Lesotho		1995		MLT	LEM	-	GPG/NAT
Madagascar		2004		SIN	DEF	SIN	GPG
Malawi		1991		MLT	LEM	SIN	GPG/BWN
Mauritius			2000	MLT	LEM	SIN	GPG
Mayotte			1997	MLT	LEM	-	-
Mozambique		1994		MLT	LEM	SIN	GPG
Namibia		1992	2000	MLT	LEM	SIN	GPG
Réunion		2000		MLT	LEM	-	-
Seychelles		1992		SIN	ANC	SIN	GPG
South Africa		1995		SIN	ANC	SIN	GPG
Swaziland		1999		EXP	LEM	SIN	GPG
Uganda		2001		MLT	LEM	SIN	EXP
United Republic of Tanzania		1995		MLT	LEM	SIN	GPG
Zambia		1969	1974	MLT	LEM	SIN	GPG/NAT
Zimbabwe		1992		MLT	LEM	SIN	GPG
Eastern and Southern Africa							
Algeria	1984		2000	MLT	DEF	SIN	GPG
Burkina Faso	1980		1987	MLT	LEM	MLT	GPG
Chad			1988	MLT	DEF	SIN	GPG
Djibouti	1985			SIN	ANC	SIN	GPG
Egypt			2004	MLT	LEM	SIN	GPG
Eritrea			1997	SIN	DEF	-	-
Ethiopia		1994		MLT	LEM	SIN	GPG
Libyan Arab Jamahiriya			2005	SIN	ANC	SIN	GPG
Mali			1991	SIN	DEF	SIN	GPG
Mauritania	1982		1991	MLT	LEM	SIN	GPG
Morocco	1990			SIN	DEF	MLT	GPG
Niger	1984		2000	SIN	DEF	SIN	GPG
Somalia			1980	SIN	REG	SIN	GPG
Sudan		2000		MLT	LEM	SIN	GPG
Tunisia	2000		2005	MLT	DEF	SIN	GPG
Western Sahara	1990			EXP	DEF	SIN	GPG
Northern Africa							
Benin		1996	2005	MLT	LEM	-	-
Burundi	1997		2001	MLT	LEM	-	-
Cameroon	2005			SIN	DEF	SIN	GPG
Cape Verde			2003	SIN	DEF	SIN	GPG
Central African Republic	1994			SIN	DEF	SIN	GPG
Congo	1993			MLT	DEF	SIN	GPG
Côte d'Ivoire		1993	1993	MLT	MOD	SIN	GPG
Democratic Republic of the Congo		1989		MLT	LEM	SIN	GPG

TABLE 2
Information status on area of forest, growing stock and biomass

Country/area	Most recent data on forest area[a]			Forest area time series[b]	Forest area projection[c]	Growing stock time series[b]	Biomass estimation[d]
	Field survey/ mapping	Remote sensing	Expert estimate				
Equatorial Guinea	1990		1998	MLT	LEM	SIN	GPG
Gabon			1999	MLT	LEM	SIN	GPG
Gambia		1993		MLT	LEM	SIN	GPG/BWN
Ghana			1996	MLT	DEF	SIN	GPG/NAT
Guinea			1988	SIN	DEF	SIN	GPG
Guinea-Bissau	1976	1990		MLT	LEM	SIN	GPG
Liberia		2000		MLT	LEM	SIN	GPG
Nigeria			1994	MLT	LEM	SIN	GPG
Rwanda			2001	MLT	LEM	MLT	GPG/NAT
Saint Helena			1980	SIN	ANC	-	-
Sao Tome and Principe	1989			SIN	ANC	SIN	GPG
Senegal	2004			MLT	MOD	SIN	GPG/NAT
Sierra Leone	1986		1986	MLT	LEM	-	-
Togo	1970		2002	MLT	LEM	-	-
Western and Central Africa							
China	2001	2001	2005	MLT	MOD	MLT	GPG/NAT
Democratic People's Republic of Korea	1996		1996	MLT	LEM	MLT	GPG
Japan	2002	2002		MLT	LEM	MLT	GPG/NAT
Mongolia	2002		2005	MLT	LEM	SIN	GPG
Republic of Korea	2000			MLT	LEM	MLT	GPG/NAT
East Asia							
Bangladesh	1995	1995		MLT	LEM	MLT	GPG
Bhutan	1999	1999		MLT	LEM	SIN	GPG/BWN
Brunei Darussalam	1979	1979	1996	MLT	LEM	SIN	GPG/BWN
Cambodia	2002	2002		MLT	LEM	SIN	GPG/BWN
India	2001	2001		MLT	REG	MLT	GPG/NAT/EXP
Indonesia	2000	2000		MLT	LEM	MLT	GPG/EXP
Lao People's Democratic Republic	1997	2002		MLT	LEM	SIN	GPG/BWN
Malaysia	1997		2005	MLT	MOD	MLT	GPG/BWN
Maldives	1991		2005	SIN	LEM	-	-
Myanmar	2000	2000		MLT	LEM	MLT	GPG/BWN
Nepal	1994	1994	2005	MLT	LEM	MLT	GPG/NAT
Pakistan	1984	1990	2005	MLT	LEM	SIN	GPG/BWN
Philippines	2003			MLT	LEM	MLT	GPG/EXP
Singapore			1997	SIN	ANC	-	-
Sri Lanka	1996	1996		MLT	LEM	MLT	GPG/BWN
Thailand	1998	1998		MLT	LEM	SIN	GPG
Timor-Leste	1989	2000		MLT	LEM	-	-
Viet Nam	2003		2005	MLT	LEM	MLT	GPG/BWN
South and Southeast Asia							
Afghanistan	1979			MLT	LEM	SIN	GPG
Armenia	1988			MLT	DEF	MLT	GPG/NAT
Azerbaijan	1988			SIN	ANC	SIN	GPG/NAT
Bahrain	1998			SIN	MOD	-	-
Cyprus	1999		2005	MLT	MOD	SIN	GPG

TABLE 2
Information status on area of forest, growing stock and biomass

Country/area	Most recent data on forest area[a]			Forest area time series[b]	Forest area projection[c]	Growing stock time series[b]	Biomass estimation[d]
	Field survey/ mapping	Remote sensing	Expert estimate				
Georgia	1995			MLT	LEM	MLT	GPG
Iran (Islamic Republic of)	2000	1998		MLT	MOD	MLT	GPG/NAT
Iraq	1990		2005	MLT	MOD	-	-
Israel	2003	1995		MLT	LEM	SIN	-
Jordan	1990		2005	SIN	ANC	SIN	GPG
Kazakhstan	2003			MLT	LEM	MLT	GPG
Kuwait	1996		2005	SIN	MOD	-	-
Kyrgyzstan	2003			MLT	LEM	MLT	GPG
Lebanon	2004	2004		MLT	MOD	SIN	GPG
Occupied Palestinian Territory			2005	MLT	ANC	-	-
Oman			1990	SIN	ANC	-	-
Qatar			1997	SIN	MOD	-	-
Saudi Arabia			1996	SIN	ANC	SIN	GPG
Syrian Arab Republic			1992	EXP	LEM	-	-
Tajikistan	1997			MLT	ANC	MLT	GPG
Turkey	1999			MLT	LEM	MLT	GPG
Turkmenistan	1988			SIN	ANC	MLT	GPG
United Arab Emirates	2003			MLT	LEM	SIN	GPG/BWN
Uzbekistan	2004			MLT	MOD	MLT	GPG
Yemen	1993	1993		SIN	ANC	SIN	GPG
Western and Central Asia							
Albania	2003			MLT	REG	MLT	GPG
Andorra	1990		2005	SIN	ANC	-	-
Austria	2001			MLT	MOD	MLT	GPG/NAT
Belarus	2000			MLT	MOD	MLT	GPG
Belgium	1999			MLT	LEM	MLT	GPG/NAT/EXP
Bosnia and Herzegovina	2000			MLT	MOD	MLT	GPG/EXP
Bulgaria	2004			MLT	MOD	MLT	GPG
Channel Islands			2005	SIN	ANC	-	-
Croatia	1996			MLT	LEM	MLT	GPG/EXP
Czech Republic	2003			MLT	LEM	MLT	NAT
Denmark	2000			MLT	MOD	MLT	GPG
Estonia	2003			MLT	LEM	MLT	GPG
Faeroe Islands			2000	SIN	ANC	-	-
Finland	1999			MLT	MOD	MLT	NAT
France	2003			MLT	LEM	MLT	GPG/NAT
Germany	2002			MLT	MOD	MLT	GPG/NAT
Gibraltar				-	ANC	-	-
Greece	1992			MLT	LEM	SIN	ECE
Holy See				-	ANC	-	-
Hungary	2000			MLT	MOD	MLT	GPG
Iceland	1991			MLT	MOD	MLT	GPG/NAT
Ireland	2002			MLT	MOD	MLT	GPG
Isle of Man			1991	SIN	ANC	-	-
Italy	2002	2001		MLT	LEM	MLT	GPG/NAT
Latvia	1994			MLT	LEM	MLT	GPG
Liechtenstein			2005	MLT	MOD	SIN	GPG

TABLE 2
Information status on area of forest, growing stock and biomass

Country/area	Most recent data on forest area[a]			Forest area time series[b]	Forest area projection[c]	Growing stock time series[b]	Biomass estimation[d]
	Field survey/ mapping	Remote sensing	Expert estimate				
Lithuania	2003			MLT	MOD	MLT	NAT
Luxembourg	2000			MLT	ANC	MLT	NAT
Malta			2005	SIN	ANC	SIN	GPG
Monaco				-	ANC	-	-
Netherlands	2000			MLT	LEM	MLT	GPG
Norway	2000			MLT	LEM	MLT	NAT
Poland	2003		2005	MLT	LEM	MLT	GPG
Portugal		1995		MLT	LEM	MLT	ECE
Republic of Moldova	1997			MLT	DEF	MLT	GPG
Romania	2003			MLT	LEM	SIN	GPG
Russian Federation	2003	2003	2005	MLT	LEM	MLT	NAT
San Marino				-	ANC	-	-
Serbia and Montenegro	1995			MLT	LEM	SIN	GPG
Slovakia	2003			MLT	MOD	MLT	NAT
Slovenia	1990			SIN/EXP	MOD	MLT	GPG
Spain	1998			MLT	LEM	MLT	GPG
Sweden	2002			MLT	LEM	MLT	NAT
Switzerland	1994			MLT	LEM	MLT	GPG
The former Yugoslav Republic of Macedonia	1990			SIN	ANC	SIN	GPG
Ukraine	2002			MLT	LEM	MLT	NAT
United Kingdom	1999			MLT/EXP	MOD	MLT	ECE
Europe							
Anguilla			1982	SIN	ANC	-	-
Antigua and Barbuda			1980	SIN	ANC	-	-
Aruba			1986	SIN	ANC	-	-
Bahamas	1986			SIN	ANC	SIN	-
Barbados			1998	SIN	ANC	-	-
Bermuda			2005	SIN	ANC	-	-
British Virgin Islands			1991	MLT	LEM	-	BWN
Cayman Islands			2000	SIN	ANC	-	-
Cuba	1990			MLT	LEM	MLT	EXP
Dominica			2000	MLT	LEM	-	-
Dominican Republic			1998	SIN	ANC	SIN	GPG
Grenada			1991	MLT	LEM	-	-
Guadeloupe			1999	MLT	LEM	-	-
Haiti	1956		1988	MLT	LEM	SIN	BWN
Jamaica	1989	1998		MLT	LEM	SIN	GPG/BWN
Martinique			1997	SIN	ANC	-	-
Montserrat			1982	SIN	ANC	-	-
Netherlands Antilles			1991	SIN	ANC	-	-
Puerto Rico		2000		MLT	LEM	SIN	EXP
Saint Kitts and Nevis			1992	MLT	ANC	-	-
Saint Lucia		1989		SIN	ANC	-	-
Saint Vincent and the Grenadines			1993	MLT	LEM	-	-
Trinidad and Tobago		1994		MLT	LEM	SIN	GPG
Turks and Caicos Islands			1983	SIN	ANC	-	-

TABLE 2
Information status on area of forest, growing stock and biomass

Country/area	Most recent data on forest area[a]			Forest area time series[b]	Forest area projection[c]	Growing stock time series[b]	Biomass estimation[d]
	Field survey/ mapping	Remote sensing	Expert estimate				
United States Virgin Islands		2000		MLT	REG	SIN	NAT
Caribbean							
Belize		2000		SIN	ANC	SIN	GPG
Costa Rica		2000		MLT	LEM	SIN	GPG/NAT/EXP
El Salvador		2003		SIN	DEF	-	-
Guatemala	2003	2003		SIN	DEF	SIN	GPG
Honduras			1990	MLT	DEF	MLT	-
Nicaragua		1998		MLT	LEM	SIN	GPG
Panama		2000		MLT	LEM	MLT	GPG
Central America							
Canada	2001	2001		SIN	ANC	SIN	-
Greenland			2005	SIN	ANC	-	-
Mexico		2002		MLT	LEM	-	-
Saint Pierre and Miquelon		2004		SIN	ANC	-	-
United States of America	2002			MLT	LEM	MLT	NAT
North America							
American Samoa	2001	2001		MLT	MOD	SIN	GPG
Australia	2002	2002	2005	MLT	MOD	-	-
Cook Islands			1998	MLT	MOD	-	-
Fiji	2002			MLT	MOD	-	-
French Polynesia			2000	SIN	ANC	-	-
Guam	2002			SIN	ANC	SIN	GPG
Kiribati			1996	SIN	ANC	-	-
Marshall Islands				-	ANC	-	-
Micronesia (Federated States of)	1983			SIN	ANC	SIN	GPG
Nauru			1996		ANC	-	-
New Caledonia	1974		1999	SIN	ANC	SIN	GPG
New Zealand		2002		MLT	LEM	-	GPG/NAT
Niue			1994	MLT	LEM	-	-
Northern Mariana Islands		2002		MLT	LEM	-	-
Palau		2002		MLT	LEM	SIN	GPG
Papua New Guinea	1996			MLT	LEM	SIN	-
Pitcairn			2005	SIN	ANC	-	-
Samoa		2003		MLT	LEM	-	-
Solomon Islands	2003			MLT	LEM	-	-
Tokelau			2005	SIN	ANC	-	-
Tonga	1998			SIN	ANC	-	-
Tuvalu			1983	EXP	ANC	-	-
Vanuatu	1992			SIN	ANC	-	-
Wallis and Futuna Islands	2003			MLT	LEM	-	-
Oceania							
Argentina	1998	1998		MLT	LEM	MLT	GPG
Bolivia		2000		SIN	DEF	SIN	GPG
Brazil		2004		MLT	DEF	MLT	NAT

TABLE 2
Information status on area of forest, growing stock and biomass

Country/area	Most recent data on forest area[a]			Forest area time series[b]	Forest area projection[c]	Growing stock time series[b]	Biomass estimation[d]
	Field survey/ mapping	Remote sensing	Expert estimate				
Chile	2001	2001		MLT	LEM	MLT	GPG/NAT
Colombia		2001		MLT	LEM	-	NAT
Ecuador		2000		MLT	LEM	-	-
Falkland Islands			2005	SIN	ANC	-	-
French Guiana		2000		MLT	LEM	SIN	-
Guyana			1999	SIN	ANC	-	EXP
Paraguay		2002		SIN	DEF	-	-
Peru		2000		MLT	LEM	-	-
South Georgia and the South Sandwich Islands				SIN	ANC	-	-
Suriname		1998		SIN	ANC	SIN	GPG/NAT
Uruguay		1999		MLT	LEM	SIN	-
Venezuela (Bolivarian Republic of)		1995		MLT	LEM	-	-
South America							

[a] Where data were collected over a range of years, the midpoint year is given.

[b] SIN: reported figures based on data for one point in time; MLT: reported figures based on data for two or more points in time; EXP: reported figures based on expert estimates.

[c] ANC: assumed no change between two or more reference years; DEF: separate studies on deforestation or forest area changes used for estimation and forecasting; LEM: linear interpolation or extrapolation; MOD: model-based method of estimation between two or more points by making assumptions to modify linear trends (use of plantation area, regeneration area, land-use matrix or assuming no change, etc.).

[d] NAT: national factors developed by research; GPG: factors from IPCC (2003); BWN: expansion factors from FAO (1997a); ECE: estimates and factors from UNECE & FAO (2000); EXP: expert estimates.

TABLE 3

Extent of forest and other wooded land 2005

Country/area	Land area					Inland water *(1 000 ha)*	Total area *(1 000 ha)*
	Forest		Other wooded land *(1 000 ha)*	Other land *(1 000 ha)*			
	1 000 ha	% of land area		Total	With tree cover		
Angola	59 104	47.4	-	65 566	-	0	124 670
Botswana	11 943	21.1	34 791	9 939	-	1 500	58 173
British Indian Ocean Territory	3	32.5	0	5	-	0	8
Comoros	5	2.9	-	180	-	n.s.	186
Kenya	3 522	6.2	34 920	18 472	10 320	1 123	58 037
Lesotho	8	0.3	31	2 996	-	-	3 035
Madagascar	12 838	22.1	17 054	28 262	-	550	58 704
Malawi	3 402	36.2	-	6 006	7	2 440	11 848
Mauritius	37	18.2	15	151	-	1	204
Mayotte	5	14.7	-	32	-	0	37
Mozambique	19 262	24.6	40 919	18 228	-	1 750	80 159
Namibia	7 661	9.3	8 473	66 195	-	100	82 429
Réunion	84	33.6	55	111	18	1	251
Seychelles	40	88.9	-	5	-	0	45
South Africa	9 203	7.6	21 409	90 835	-	462	121 909
Swaziland	541	31.5	289	890	-	16	1 736
Uganda	3 627	18.4	1 150	14 933	-	4 394	24 104
United Republic of Tanzania	35 257	39.9	4 756	48 346	-	6 150	94 509
Zambia	42 452	57.1	3 161	28 726	-	922	75 261
Zimbabwe	17 540	45.3	-	21 145	-	390	39 075
Total Eastern and Southern Africa	**226 534**	**27.8**	**167 023**	**421 024**	**10 345**	**19 799**	**834 380**
Algeria	2 277	1.0	1 595	234 302	-	-	238 174
Burkina Faso	6 794	29.0	7 427	9 178	-	4 000	27 400
Chad	11 921	9.5	9 152	104 847	-	2 480	128 400
Djibouti	6	0.2	220	2 092	-	2	2 320
Egypt	67	0.1	20	99 458	-	600	100 145
Eritrea	1 554	15.4	7 257	1 289	-	1 660	11 760
Ethiopia	13 000	11.9	44 650	51 981	-	799	110 430
Libyan Arab Jamahiriya	217	0.1	330	175 407	-	0	175 954
Mali	12 572	10.3	16 532	92 916	-	2 000	124 019
Mauritania	267	0.3	3 110	99 145	-	30	102 552
Morocco	4 364	9.8	406	39 860	-	25	44 655
Niger	1 266	1.0	3 740	121 664	8 000	30	126 700
Somalia	7 131	11.4	-	55 603	-	1 032	63 766
Sudan	67 546	28.4	-	170 054	-	12 981	250 581
Tunisia	1 056	6.8	170	14 310	2 207	825	16 361
Western Sahara	1 011	3.8	-	25 589	-	-	26 600
Total Northern Africa	**131 048**	**8.6**	**94 609**	**1 297 696**	**10 207**	**26 464**	**1 549 817**
Benin	2 351	21.3	3 959	4 752	-	200	11 262
Burundi	152	5.9	722	1 694	-	215	2 783
Cameroon	21 245	45.6	14 758	10 537	-	1 004	47 544
Cape Verde	84	20.7	-	319	-	0	403
Central African Republic	22 755	36.5	10 122	29 421	-	-	62 298
Congo	22 471	65.8	10 547	1 132	-	50	34 200

TABLE 3
Extent of forest and other wooded land 2005

Country/area	Land area					Inland water *(1 000 ha)*	Total area *(1 000 ha)*
	Forest		Other wooded land *(1 000 ha)*	Other land *(1 000 ha)*			
	1 000 ha	% of land area		Total	With tree cover		
Côte d'Ivoire	10 405	32.7	2 626	18 769	379	446	32 246
Democratic Republic of the Congo	133 610	58.9	83 277	9 819	-	7 781	234 486
Equatorial Guinea	1 632	58.2	31	1 142	-	0	2 805
Gabon	21 775	84.5	-	3 992	-	1 000	26 767
Gambia	471	41.7	125	534	-	0	1 130
Ghana	5 517	24.2	0	17 237	-	1 100	23 854
Guinea	6 724	27.4	5 850	11 998	-	14	24 586
Guinea-Bissau	2 072	73.7	236	505	-	800	3 612
Liberia	3 154	32.7	0	6 478	179	1 505	11 137
Nigeria	11 089	12.2	5 495	74 493	220	1 300	92 377
Rwanda	480	19.5	61	1 926	-	167	2 634
Saint Helena	2	6.5	0	29	-	0	31
Sao Tome and Principe	27	28.4	29	40	10	0	96
Senegal	8 673	45.0	5 001	5 579	-	419	19 672
Sierra Leone	2 754	38.5	384	4 024	-	12	7 174
Togo	386	7.1	1 246	3 807	-	240	5 679
Total Western and Central Africa	**277 829**	**44.1**	**144 468**	**208 227**	**788**	**16 253**	**646 776**
Total Africa	**635 412**	**21.4**	**406 100**	**1 926 946**	**21 339**	**62 516**	**3 030 974**
China	197 290	21.2	87 615	647 837	-	27 063	959 805
Democratic People's Republic of Korea	6 187	51.4	-	5 854	-	13	12 054
Japan	24 868	68.2	-	11 582	-	1 330	37 780
Mongolia	10 252	6.5	2 388	144 010	-	0	156 650
Republic of Korea	6 265	63.5	-	3 608	-	53	9 926
Total East Asia	**244 862**	**21.3**	**90 003**	**812 891**	**-**	**28 459**	**1 176 215**
Bangladesh	871	6.7	58	12 087	343	1 383	14 400
Bhutan	3 195	68.0	611	894	-	0	4 700
Brunei Darussalam	278	52.8	160	89	-	50	577
Cambodia	10 447	59.2	270	6 935	-	452	18 104
India	67 701	22.8	4 110	225 508	815	31 407	328 726
Indonesia	88 495	48.8	-	92 662	9 648	9 300	190 457
Lao People's Democratic Republic	16 142	69.9	4 643	2 295	-	600	23 680
Malaysia	20 890	63.6	-	11 965	-	120	32 975
Maldives	1	3.0	0	29	-	0	30
Myanmar	32 222	49.0	10 834	22 699	-	1 903	67 658
Nepal	3 636	25.4	1 897	8 767	-	418	14 718
Pakistan	1 902	2.5	1 389	73 797	-	2 522	79 610
Philippines	7 162	24.0	3 611	19 044	-	183	30 000
Singapore	2	3.4	0	65	0	1	68
Sri Lanka	1 933	29.9	0	4 530	-	98	6 561
Thailand	14 520	28.4	-	36 569	-	223	51 312
Timor-Leste	798	53.7	-	689	-	-	1 487
Viet Nam	12 931	39.7	2 259	17 359	-	620	33 169
Total South and Southeast Asia	**283 127**	**33.4**	**29 842**	**535 983**	**10 806**	**49 280**	**898 232**

TABLE 3
Extent of forest and other wooded land 2005

Country/area	Land area					Inland water *(1 000 ha)*	Total area *(1 000 ha)*
	Forest		Other wooded land *(1 000 ha)*	Other land *(1 000 ha)*			
	1 000 ha	% of land area		Total	With tree cover		
Afghanistan	867	1.3	-	64 342	-	0	65 209
Armenia	283	10.0	45	2 492	7	160	2 980
Azerbaijan	936	11.3	54	7 270	-	400	8 660
Bahrain	n.s.	0.6	0	71	-	0	71
Cyprus	174	18.9	214	536	26	1	925
Georgia	2 760	39.7	50	4 139	-	21	6 970
Iran (Islamic Republic of)	11 075	6.8	5 340	147 205	83	1 200	164 820
Iraq	822	1.9	927	41 988	70	95	43 832
Israel	171	8.3	85	1 806	-	44	2 106
Jordan	83	0.9	52	8 758	222	28	8 921
Kazakhstan	3 337	1.2	15 622	251 011	3	2 520	272 490
Kuwait	6	0.3	0	1 776	-	0	1 782
Kyrgyzstan	869	4.5	313	17 998	-	810	19 990
Lebanon	136	13.3	106	780	114	17	1 040
Occupied Palestinian Territory	9	1.5	-	593	-	19	621
Oman	2	n.s.	1 303	19 941	50	0	21 246
Qatar	n.s.	n.s.	n.s.	1 100	-	0	1 100
Saudi Arabia	2 728	1.3	34 155	178 086	0	0	214 969
Syrian Arab Republic	461	2.5	35	17 882	231	140	18 518
Tajikistan	410	2.9	142	13 444	102	259	14 255
Turkey	10 175	13.2	10 689	56 099	-	519	77 482
Turkmenistan	4 127	8.8	0	42 866	-	1 817	48 810
United Arab Emirates	312	3.7	4	8 044	195	0	8 360
Uzbekistan	3 295	8.0	904	37 225	-	3 316	44 740
Yemen	549	1.0	1 406	50 842	42	0	52 797
Total Western and Central Asia	**43 588**	**4.0**	**71 446**	**976 294**	**1 145**	**11 366**	**1 102 694**
Total Asia	**571 577**	**18.5**	**191 291**	**2 325 168**	**11 951**	**89 105**	**3 177 141**
Albania	794	29.0	261	1 685	-	135	2 875
Andorra	16	35.6	-	29	-	0	45
Austria	3 862	46.7	118	4 293	-	113	8 386
Belarus	7 894	38.0	914	11 940	-	12	20 760
Belgium	667	22.0	27	2 334	-	25	3 053
Bosnia and Herzegovina	2 185	43.1	549	2 339	-	47	5 120
Bulgaria	3 625	32.8	27	7 411	-	36	11 099
Channel Islands	1	4.1	0	18	0	n.s.	19
Croatia	2 135	38.2	346	3 111	-	62	5 654
Czech Republic	2 648	34.3	0	5 080	96	159	7 887
Denmark	500	11.8	136	3 607	-	66	4 309
Estonia	2 284	53.9	82	1 873	-	284	4 523
Faeroe Islands	n.s.	0.1	-	140	-	0	140
Finland	22 500	73.9	802	7 145	177	3 367	33 814
France	15 554	28.3	1 708	37 748	269	140	55 150
Germany	11 076	31.7	-	23 819	-	808	35 703
Gibraltar	0	0	0	1	0	0	1
Greece	3 752	29.1	2 780	6 358	-	306	13 196

TABLE 3
Extent of forest and other wooded land 2005

Country/area	Land area					Inland water *(1 000 ha)*	Total area *(1 000 ha)*
	Forest		Other wooded land *(1 000 ha)*	Other land *(1 000 ha)*			
	1 000 ha	% of land area		Total	With tree cover		
Holy See	0	0	0	n.s.	-	0	n.s.
Hungary	1 976	21.5	0	7 235	95	92	9 303
Iceland	46	0.5	104	9 875	8	275	10 300
Ireland	669	9.7	41	6 179	-	138	7 027
Isle of Man	3	6.1	0	54	0	n.s.	57
Italy	9 979	33.9	1 047	18 385	-	723	30 134
Latvia	2 941	47.4	115	3 149	29	255	6 460
Liechtenstein	7	43.1	0	9	-	0	16
Lithuania	2 099	33.5	77	4 092	62	262	6 530
Luxembourg	87	33.5	1	170	-	0	259
Malta	n.s.	1.1	0	32	-	0	32
Monaco	0	0	0	n.s.	n.s.	0	n.s.
Netherlands	365	10.8	0	3 023	0	765	4 153
Norway	9 387	30.7	2 613	18 625	-	1 751	32 376
Poland	9 192	30.0	-	21 437	-	640	31 269
Portugal	3 783	41.3	84	5 283	-	48	9 198
Republic of Moldova	329	10.0	31	2 928	-	96	3 384
Romania	6 370	27.7	258	16 359	-	852	23 839
Russian Federation	808 790	47.9	74 185	805 875	4 698	18 690	1 707 540
San Marino	n.s.	1.6	0	6	-	0	6
Serbia and Montenegro	2 694	26.4	808	6 698	269	17	10 217
Slovakia	1 929	40.1	-	2 879	32	93	4 901
Slovenia	1 264	62.8	44	706	24	13	2 027
Spain	17 915	35.9	10 299	21 730	-	655	50 599
Sweden	27 528	66.9	3 257	10 377	1 353	3 834	44 996
Switzerland	1 221	30.9	67	2 667	-	174	4 129
The former Yugoslav Republic of Macedonia	906	35.8	82	1 543	-	40	2 571
Ukraine	9 575	16.5	41	48 319	907	2 435	60 370
United Kingdom	2 845	11.8	20	21 223	24	203	24 291
Total Europe	**1 001 394**	**44.3**	**100 925**	**1 157 788**	**8 044**	**37 611**	**2 297 719**
Anguilla	6	71.4	-	2	-	-	8
Antigua and Barbuda	9	21.4	16	19	-	0	44
Aruba	n.s.	2.2	0	19	-	0	19
Bahamas	515	51.5	36	450	-	387	1 388
Barbados	2	4.0	-	41	-	0	43
Bermuda	1	20.0	0	4	0	0	5
British Virgin Islands	4	24.4	2	10	-	0	15
Cayman Islands	12	48.4	4	10	-	n.s.	26
Cuba	2 713	24.7	260	8 009	257	104	11 086
Dominica	46	61.3	n.s.	29	-	0	75
Dominican Republic	1 376	28.4	678	2 784	-	35	4 873
Grenada	4	12.2	5	25	-	0	34
Guadeloupe	80	47.2	2	87	-	2	171
Haiti	105	3.8	-	2 651	-	19	2 775
Jamaica	339	31.3	188	556	82	16	1 099

TABLE 3
Extent of forest and other wooded land 2005

Country/area	Land area					Inland water *(1 000 ha)*	Total area *(1 000 ha)*
	Forest		Other wooded land *(1 000 ha)*	Other land *(1 000 ha)*			
	1 000 ha	% of land area		Total	With tree cover		
Martinique	46	43.9	-	60	-	4	110
Montserrat	4	35.0	-	6	-	0	10
Netherlands Antilles	1	1.5	33	46	-	0	80
Puerto Rico	408	46.0	-	479	-	8	895
Saint Kitts and Nevis	5	14.7	6	25	-	0	36
Saint Lucia	17	27.9	5	39	-	1	62
Saint Vincent and the Grenadines	11	27.4	2	26	-	0	39
Trinidad and Tobago	226	44.1	74	213	-	0	513
Turks and Caicos Islands	34	80.0	-	9	-	0	43
United States Virgin Islands	10	27.9	-	24	-	0	34
Total Caribbean	**5 974**	**26.1**	**1 310**	**15 622**	**339**	**576**	**23 482**
Belize	1 653	72.5	115	512	-	16	2 296
Costa Rica	2 391	46.8	10	2 705	-	4	5 110
El Salvador	298	14.4	201	1 573	167	32	2 104
Guatemala	3 938	36.3	1 672	5 233	139	46	10 889
Honduras	4 648	41.5	710	5 831	-	20	11 209
Nicaragua	5 189	42.7	1 022	5 929	-	860	13 000
Panama	4 294	57.7	1 288	1 861	143	109	7 552
Total Central America	**22 411**	**43.9**	**5 018**	**23 644**	**449**	**1 087**	**52 160**
Canada	310 134	33.6	91 951	520 012	-	74 964	997 061
Greenland	n.s.	n.s.	8	41 037	-	0	41 045
Mexico	64 238	33.7	19 908	106 723	-	4 951	195 820
Saint Pierre and Miquelon	3	13.0	-	20	-	1	24
United States of America	303 089	33.1	-	612 807	32 899	47 013	962 909
Total North America	**677 464**	**32.7**	**111 866**	**1 280 599**	**32 899**	**126 929**	**2 196 859**
Total North and Central America	**705 849**	**32.9**	**118 194**	**1 319 865**	**33 687**	**128 592**	**2 272 501**
American Samoa	18	89.4	-	2	-	0	20
Australia	163 678	21.3	421 590[a]	182 962	-	5 892	774 122
Cook Islands	16	66.5	-	8	-	0	23
Fiji	1 000	54.7	-	827	59	0	1 827
French Polynesia	105	28.7	-	261	-	34	400
Guam	26	47.1	0	29	-	0	55
Kiribati	2	30.0	-	71	17	0	73
Marshall Islands	-	-	-	18	-	0	18
Micronesia (Federated States of)	63	90.6	-	7	-	0	70
Nauru	0	0	0	2	-	0	2
New Caledonia	717	39.2	787	324	-	30	1 858
New Zealand	8 309	31.0	2 557	15 933	-	254	27 053
Niue	14	54.2	-	12	-	0	26
Northern Mariana Islands	33	72.4	-	13	-	0	46
Palau	40	87.6	-	6	-	0	46
Papua New Guinea	29 437	65.0	4 474	11 375	-	998	46 284
Pitcairn	4	83.3	0	n.s.	0	0	4

TABLE 3
Extent of forest and other wooded land 2005

Country/area	Land area					Inland water *(1 000 ha)*	Total area *(1 000 ha)*
	Forest		Other wooded land *(1 000 ha)*	Other land *(1 000 ha)*			
	1 000 ha	% of land area		Total	With tree cover		
Samoa	171	60.4	22	90	63	1	284
Solomon Islands	2 172	77.6	-	627	-	91	2 890
Tokelau	0	0	0	1	-	0	1
Tonga	4	5.0	1	68	-	3	75
Tuvalu	1	33.3	0	2	-	0	3
Vanuatu	440	36.1	476	304	-	0	1 219
Wallis and Futuna Islands	5	35.3	1	8	5	n.s.	14
Total Oceania	**206 254**	**24.3**	**429 908**	**212 948**	**145**	**7 303**	**856 414**
Argentina	33 021	12.1	60 961	179 687	-	4 371	278 040
Bolivia	58 740	54.2	2 473	47 225	-	1 420	109 858
Brazil	477 698	57.2	-	357 858	-	15 932	851 488
Chile	16 121	21.5	13 241	45 518	-	783	75 663
Colombia	60 728	58.5	18 202	24 940	-	10 021	113 891
Ecuador	10 853	39.2	1 448	15 382	-	672	28 356
Falkland Islands	0	0	0	1 217	0	0	1 217
French Guiana	8 063	91.8	0	724	0	213	9 000
Guyana	15 104	76.7	3 580	1 002	-	1 812	21 497
Paraguay	18 475	46.5	-	21 255	-	945	40 675
Peru	68 742	53.7	22 132	37 126	600	522	128 522
South Georgia and the South Sandwich Islands	0	0	0	409	-	0	409
Suriname	14 776	94.7	-	824	-	727	16 327
Uruguay	1 506	8.6	4	15 992	13	120	17 622
Venezuela (Bolivarian Republic of)	47 713	54.1	7 369	33 123	-	3 000	91 205
Total South America	**831 540**	**47.7**	**129 410**	**782 282**	**613**	**40 538**	**1 783 770**
WORLD	**3 952 025**	**30.3**	**1 375 829**	**7 724 961**	**75 779**	**365 666**	**13 418 518**

[a] FAO estimate based on the assumption that the area of other wooded land has been constant since 2000.

TABLE 4
Change in extent of forest and other wooded land 1990–2005

Country/area	Forest							Other wooded land		
	Area (1 000 ha)			Annual change rate				Area (1 000 ha)		
	1990	2000	2005	1990–2000		2000–2005		1990	2000	2005
				1 000 ha/year	%[a]	1 000 ha/year	%[a]			
Angola	60 976	59 728	59 104	-125	-0.2	-125	-0.2	-	-	-
Botswana	13 718	12 535	11 943	-118.0	-0.9	-118	-1.0	34 791	34 791	34 791
British Indian Ocean Territory	3	3	3	0	0	0	0	0	0	0
Comoros	12	8	5	n.s.	-4.0	-1	-7.4	-	-	-
Kenya	3 708	3 582	3 522	-13	-0.3	-12	-0.3	35 530	35 120	34 920
Lesotho	5	7	8	n.s.	3.4	n.s.	2.7	103	55	31
Madagascar	13 692	13 023	12 838	-67	-0.5	-37	-0.3	21 148	18 453	17 054
Malawi	3 896	3 567	3 402	-33	-0.9	-33	-0.9	-	-	-
Mauritius	39	38	37	n.s.	-0.3	n.s.	-0.5	18	17	15
Mayotte	6	6	5	n.s.	-0.4	n.s.	-0.4	-	-	-
Mozambique	20 012	19 512	19 262	-50	-0.3	-50	-0.3	42 419	41 419	40 919
Namibia	8 762	8 033	7 661	-73	-0.9	-74	-0.9	9 023	8 656	8 473
Réunion	87	87	84	n.s.	-0.1	-1	-0.7	57	54	55
Seychelles	40	40	40	0	0	0	0	-	-	-
South Africa	9 203	9 203	9 203	0	0	0	0	21 409	21 409	21 409
Swaziland	472	518	541	5	0.9	5	0.9	152	276	289
Uganda	4 924	4 059	3 627	-86	-1.9	-86	-2.2	1 404	1 235	1 150
United Republic of Tanzania	41 441	37 318	35 257	-412	-1.0	-412	-1.1	22 374	10 629	4 756
Zambia	49 124	44 676	42 452	-445	-0.9	-445	-1.0	4 081	3 468	3 161
Zimbabwe	22 234	19 105	17 540	-313	-1.5	-313	-1.7	5 437	-	-
Total Eastern and Southern Africa	**252 354**	**235 047**	**226 534**	**-1 731**	**-0.7**	**-1 702**	**-0.7**			
Algeria	1 790	2 144	2 277	35	1.8	27	1.2	1 840	1 662	1 595
Burkina Faso	7 154	6 914	6 794	-24	-0.3	-24	-0.3	7 427	7 427	7 427
Chad	13 110	12 317	11 921	-79	-0.6	-79	-0.7	10 070	9 458	9 152
Djibouti	6	6	6	0	0	0	0	220	220	220
Egypt	44	59	67	2	3.0	2	2.6	20	20	20
Eritrea	1 621	1 576	1 554	-4	-0.3	-4	-0.3	7 569	7 361	7 257
Ethiopia	15 114	13 705	13 000	-141	-1.0	-141	-1.1	44 650	44 650	44 650
Libyan Arab Jamahiriya	217	217	217	0	0	0	0	330	330	330
Mali	14 072	13 072	12 572	-100	-0.7	-100	-0.8	16 532	16 532	16 532
Mauritania	415	317	267	-10	-2.7	-10	-3.4	3 110	3 110	3 110
Morocco	4 289	4 328	4 364	4	0.1	7	0.2	407	407	406
Niger	1 945	1 328	1 266	-62	-3.7	-12	-1.0	4 640	4 040	3 740
Somalia	8 282	7 515	7 131	-77	-1.0	-77	-1.0	-	-	-
Sudan	76 381	70 491	67 546	-589	-0.8	-589	-0.8	-	54 153	-
Tunisia	643	959	1 056	32	4.1	19	1.9	328	177	170
Western Sahara	1 011	1 011	1 011	0	0	0	0	-	-	-
Total Northern Africa	**146 093**	**135 958**	**131 048**	**-1 013**	**-0.7**	**-982**	**-0.7**			
Benin	3 322	2 675	2 351	-65	-2.1	-65	-2.5	3 590	3 836	3 959
Burundi	289	198	152	-9	-3.7	-9	-5.2	722	722	722
Cameroon	24 545	22 345	21 245	-220	-0.9	-220	-1.0	14 758	14 758	14 758
Cape Verde	58	82	84	2	3.6	n.s.	0.4	-	-	-
Central African Republic	23 203	22 903	22 755	-30	-0.1	-30	-0.1	10 122	10 122	10 122
Congo	22 726	22 556	22 471	-17	-0.1	-17	-0.1	10 649	10 581	10 547

TABLE 4
Change in extent of forest and other wooded land 1990–2005

Country/area	Forest							Other wooded land		
	Area *(1 000 ha)*			Annual change rate				Area *(1 000 ha)*		
	1990	2000	2005	1990–2000		2000–2005		1990	2000	2005
				1 000 ha/year	%[a]	1 000 ha/year	%[a]			
Côte d'Ivoire	10 222	10 328	10 405	11	0.1	15	0.1	2 675	2 662	2 626
Democratic Republic of the Congo	140 531	135 207	133 610	-532	-0.4	-319	-0.2	83 277	83 277	83 277
Equatorial Guinea	1 860	1 708	1 632	-15	-0.8	-15	-0.9	5	22	31
Gabon	21 927	21 826	21 775	-10	n.s.	-10	n.s.	-	-	-
Gambia	442	461	471	2	0.4	2	0.4	170	140	125
Ghana	7 448	6 094	5 517	-135	-2.0	-115	-2.0	0	0	0
Guinea	7 408	6 904	6 724	-50	-0.7	-36	-0.5	5 850	5 850	5 850
Guinea-Bissau	2 216	2 120	2 072	-10	-0.4	-10	-0.5	293	241	236
Liberia	4 058	3 455	3 154	-60	-1.6	-60	-1.8	0	0	0
Nigeria	17 234	13 137	11 089	-410	-2.7	-410	-3.3	9 717	6 902	5 495
Rwanda	318	344	480	3	0.8	27	6.9	175	61	61
Saint Helena	2	2	2	0	0	0	0	0	0	0
Sao Tome and Principe	27	27	27	0	0	0	0	29	29	29
Senegal	9 348	8 898	8 673	-45	-0.5	-45	-0.5	5 301	5 101	5 001
Sierra Leone	3 044	2 851	2 754	-19	-0.7	-19	-0.7	765	511	384
Togo	685	486	386	-20	-3.4	-20	-4.5	1 246	1 246	1 246
Total Western and Central Africa	**300 914**	**284 608**	**277 829**	**-1 631**	**-0.6**	**-1 356**	**-0.5**			
Total Africa	**699 361**	**655 613**	**635 412**	**-4 375**	**-0.64**	**-4 040**	**-0.62**			
China	157 141	177 001	197 290	1 986	1.2	4 058	2.2	101 498	97 683	87 615
Democratic People's Republic of Korea	8 201	6 821	6 187	-138	-1.8	-127	-1.9	-	-	-
Japan	24 950	24 876	24 868	-7	n.s.	-2	n.s.	-	-	-
Mongolia	11 492	10 665	10 252	-83	-0.7	-83	-0.8	6 264	3 034	2 388
Republic of Korea	6 371	6 300	6 265	-7	-0.1	-7	-0.1	-	-	-
Total East Asia	**208 155**	**225 663**	**244 862**	**1 751**	**0.8**	**3 840**	**1.6**			
Bangladesh	882	884	871	n.s.	n.s.	-2	-0.3	44	53	58
Bhutan	3 035	3 141	3 195	11	0.3	11	0.3	566	609	611
Brunei Darussalam	313	288	278	-2	-0.8	-2	-0.7	142	155	160
Cambodia	12 946	11 541	10 447	-140	-1.1	-219	-2.0	335	298	270
India	63 939	67 554	67 701	362	0.6	29	n.s.	5 894	4 732	4 110
Indonesia	116 567	97 852	88 495	-1 872	-1.7	-1 871	-2.0	-	-	-
Lao People's Democratic Republic	17 314	16 532	16 142	-78	-0.5	-78	-0.5	2 875	4 053	4 643
Malaysia	22 376	21 591	20 890	-78	-0.4	-140	-0.7	-	-	-
Maldives	1	1	1	0	0	0	0	0	0	0
Myanmar	39 219	34 554	32 222	-466	-1.3	-466	-1.4	10 219	10 629	10 834
Nepal	4 817	3 900	3 636	-92	-2.1	-53	-1.4	1 180	1 753	1 897
Pakistan	2 527	2 116	1 902	-41	-1.8	-43	-2.1	1 191	1 323	1 389
Philippines	10 574	7 949	7 162	-262	-2.8	-157	-2.1	2 230	3 292	3 611
Singapore	2	2	2	0	0	0	0	0	0	0
Sri Lanka	2 350	2 082	1 933	-27	-1.2	-30	-1.5	0	0	0
Thailand	15 965	14 814	14 520	-115	-0.7	-59	-0.4	-	-	-
Timor-Leste	966	854	798	-11	-1.2	-11	-1.3	-	-	-
Viet Nam	9 363	11 725	12 931	236	2.3	241	2.0	0	1 816	2 259
Total South and Southeast Asia	**323 156**	**297 380**	**283 127**	**-2 578**	**-0.8**	**-2 851**	**-1.0**			

TABLE 4
Change in extent of forest and other wooded land 1990–2005

Country/area	Forest							Other wooded land		
	Area (1 000 ha)			Annual change rate				Area (1 000 ha)		
	1990	2000	2005	1990–2000		2000–2005		1990	2000	2005
				1 000 ha/year	%[a]	1 000 ha/year	%[a]			
Afghanistan	1 309	1 015	867	-29	-2.5	-30	-3.1	-	-	-
Armenia	346	305	283	-4	-1.3	-4	-1.5	45	45	45
Azerbaijan	936	936	936	0	0	0	0	54	54	54
Bahrain	n.s.	n.s.	n.s.	n.s.	5.6	n.s.	3.8	0	0	0
Cyprus	161	173	174	1	0.7	n.s.	0.2	-	214	214
Georgia	2 760	2 760	2 760	n.s.	n.s.	n.s.	n.s.	53	51	50
Iran (Islamic Republic of)	11 075	11 075	11 075	0	0	0	0	5 340	5 340	5 340
Iraq	804	818	822	1	0.2	1	0.1	1 245	1 033	927
Israel	154	164	171	1	0.6	1	0.8	16	62	85
Jordan	83	83	83	0	0	0	0	55	54	52
Kazakhstan	3 422	3 365	3 337	-6	-0.2	-6	-0.2	13 049	14 765	15 622
Kuwait	3	5	6	n.s.	3.5	n.s.	2.7	0	0	0
Kyrgyzstan	836	858	869	2	0.3	2	0.3	283	303	313
Lebanon	121[b]	131	136	1	0.8	1	0.8	-	117	106
Occupied Palestinian Territory	9[b]	9	9	0	0	0	0	-	-	-
Oman	2	2	2	0	0	0	0	1 303	1 303	1 303
Qatar	n.s.	n.s.	n.s.	0	0	0	0	n.s.	n.s.	n.s.
Saudi Arabia	2 728	2 728	2 728	0	0	0	0	34 155	34 155	34 155
Syrian Arab Republic	372	432	461	6	1.5	6	1.3	35	35	35
Tajikistan	408	410	410	n.s.	n.s.	0	0	142	142	142
Turkey	9 680	10 052	10 175	37	0.4	25	0.2	10 905	10 728	10 689
Turkmenistan	4 127	4 127	4 127	0	0	0	0	0	0	0
United Arab Emirates	245	310	312	6	2.4	n.s.	0.1	4	4	4
Uzbekistan	3 045	3 212	3 295	17	0.5	17	0.5	-	-	904
Yemen	549	549	549	0	0	0	0	1 406	1 406	1 406
Total Western and Central Asia	**43 176**	**43 519**	**43 588**	**34**	**0.1**	**14**	**n.s.**			
Total Asia	**574 487**	**566 562**	**571 577**	**-792**	**-0.14**	**1 003**	**0.18**			
Albania	789	769	794	-2	-0.3	5	0.6	256	255	261
Andorra	16	16	16	0	0	0	0	-	-	-
Austria	3 776	3 838	3 862	6	0.2	5	0.1	118	117	118
Belarus	7 376	7 848	7 894	47	0.6	9	0.1	895	915	914
Belgium	677	667	667	-1	-0.1	0	0	21	27	27
Bosnia and Herzegovina	2 210	2 185	2 185	-2	-0.1	0	0	500	549	549
Bulgaria	3 327	3 375	3 625	5	0.1	50	1.4	130	105	27
Channel Islands	1	1	1	0	0	0	0	0	0	0
Croatia	2 116	2 129	2 135	1	0.1	1	0.1	322	338	346
Czech Republic	2 630	2 637	2 648	1	n.s.	2	0.1	0	0	0
Denmark	445	486	500	4	0.9	3	0.6	136	136	136
Estonia	2 163	2 243	2 284	8	0.4	8	0.4	-	94	82
Faeroe Islands	n.s.	n.s.	n.s.	0	0	0	0	-	-	-
Finland	22 194	22 475	22 500	28	0.1	5	n.s.	923	830	802
France	14 538	15 351	15 554	81	0.5	41	0.3	2 087	1 814	1 708
Germany	10 741	11 076	11 076	34	0.3	0	0	-	-	-
Gibraltar	0	0	0	0	0	0	0	0	0	0
Greece	3 299	3 601	3 752	30	0.9	30	0.8	3 212	2 924	2 780

TABLE 4
Change in extent of forest and other wooded land 1990–2005

Country/area	Forest							Other wooded land		
	Area *(1 000 ha)*			Annual change rate				Area *(1 000 ha)*		
	1990	2000	2005	1990–2000		2000–2005		1990	2000	2005
				1 000 ha/year	%[a]	1 000 ha/year	%[a]			
Holy See	0	0	0	0	0	0	0	0	0	0
Hungary	1 801	1 907	1 976	11	0.6	14	0.7	0	0	0
Iceland	25	38	46	1	4.3	2	3.9	104	104	104
Ireland	441	609	669	17	3.3	12	1.9	40	41	41
Isle of Man	3	3	3	0	0	0	0	0	0	0
Italy	8 383	9 447	9 979	106	1.2	106	1.1	880	992	1 047
Latvia	2 775	2 885	2 941	11	0.4	11	0.4	112	120	115
Liechtenstein	6	7	7	n.s.	0.6	0	0	0	0	0
Lithuania	1 945	2 020	2 099	8	0.4	16	0.8	80	83	77
Luxembourg	86	87	87	n.s.	0.1	0	0	3	1	1
Malta	n.s.	n.s.	n.s.	0	0	0	0	0	0	0
Monaco	0	0	0	0	0	0	0	0	0	0
Netherlands	345	360	365	2	0.4	1	0.3	0	0	0
Norway	9 130	9 301	9 387	17	0.2	17	0.2	2 870	2 699	2 613
Poland	8 881	9 059	9 192	18	0.2	27	0.3	-	-	-
Portugal	3 099	3 583	3 783	48	1.5	40	1.1	236	84	84
Republic of Moldova	319	326	329	1	0.2	1	0.2	31	31	31
Romania	6 371	6 366	6 370	0	n.s.	1	n.s.	314	234	258
Russian Federation	808 950	809 268	808 790	32	n.s.	-96	n.s.	75 144	72 706	74 185
San Marino	n.s.	n.s.	n.s.	0	0	0	0	0	0	0
Serbia and Montenegro	2 559	2 649	2 694	9	0.3	9	0.3	820	812	808
Slovakia	1 922	1 921	1 929	n.s.	n.s.	2	0.1	-	-	-
Slovenia	1 188	1 239	1 264	5	0.4	5	0.4	44	44	44
Spain	13 479	16 436	17 915	296	2.0	296	1.7	12 447	11 016	10 299
Sweden	27 367	27 474	27 528	11	n.s.	11	n.s.	3 223	3 246	3 257
Switzerland	1 155	1 199	1 221	4	0.4	4	0.4	59	64	67
The former Yugoslav Republic of Macedonia	906	906	906	0	0	0	0	82	82	82
Ukraine	9 274	9 510	9 575	24	0.3	13	0.1	29	41	41
United Kingdom	2 611	2 793	2 845	18	0.7	10	0.4	20	20	20
Total Europe	**989 320**	**998 091**	**1 001 394**	**877**	**0.09**	**661**	**0.07**			
Anguilla	6	6	6	0	0	0	0	-	-	-
Antigua and Barbuda	9	9	9	0	0	0	0	16	16	16
Aruba	n.s.	n.s.	n.s.	0	0	0	0	0	0	0
Bahamas	515	515	515	0	0	0	0	36	36	36
Barbados	2	2	2	0	0	0	0	-	-	-
Bermuda	1	1	1	0	0	0	0	0	0	0
British Virgin Islands	4	4	4	n.s.	-0.1	n.s.	-0.1	2	2	2
Cayman Islands	12	12	12	0	0	0	0	4	4	4
Cuba	2 058	2 435	2 713	38	1.7	56	2.2	254	264	260
Dominica	50	47	46	n.s.	-0.5	n.s.	-0.6	n.s.	n.s.	n.s.
Dominican Republic	1 376	1 376	1 376	0	0	0	0	678	678	678
Grenada	4	4	4	n.s.	n.s.	0	0	4	5	5
Guadeloupe	84	81	80	n.s.	-0.3	n.s.	-0.3	2	2	2
Haiti	116	109	105	-1	-0.6	-1	-0.7	-	-	-

TABLE 4
Change in extent of forest and other wooded land 1990–2005

Country/area	Forest							Other wooded land		
	Area (1 000 ha)			Annual change rate				Area (1 000 ha)		
	1990	2000	2005	1990–2000		2000–2005		1990	2000	2005
				1 000 ha/year	%[a]	1 000 ha/year	%[a]			
Jamaica	345	341	339	n.s.	-0.1	n.s.	-0.1	190	189	188
Martinique	46	46	46	0	0	0	0	-	-	-
Montserrat	4	4	4	0	0	0	0	-	-	-
Netherlands Antilles	1	1	1	0	0	0	0	33	33	33
Puerto Rico	404	407	408	n.s.	0.1	n.s.	n.s.	-	-	-
Saint Kitts and Nevis	5	5	5	0	0	0	0	6	6	6
Saint Lucia	17	17	17	0	0	0	0	5	5	5
Saint Vincent and the Grenadines	9	10	11	n.s.	0.8	n.s.	0.8	3	2	2
Trinidad and Tobago	235	228	226	-1	-0.3	n.s.	-0.2	65	72	74
Turks and Caicos Islands	34	34	34	0	0	0	0	-	-	-
United States Virgin Islands	12	10	10	n.s.	-1.3	n.s.	-1.8	-	-	-
Total Caribbean	**5 350**	**5 706**	**5 974**	**36**	**0.6**	**54**	**0.9**			
Belize	1 653	1 653	1 653	0	0	0	0	115	115	115
Costa Rica	2 564	2 376	2 391	-19	-0.8	3	0.1	15	10	10
El Salvador	375	324	298	-5	-1.5	-5	-1.7	201	201	201
Guatemala	4 748	4 208	3 938	-54	-1.2	-54	-1.3	1 672	1 672	1 672
Honduras	7 385	5 430	4 648	-196	-3.0	-156	-3.1	271	559	710
Nicaragua	6 538	5 539	5 189	-100	-1.6	-70	-1.3	876	973	1 022
Panama	4 376	4 307	4 294	-7	-0.2	-3	-0.1	851	1 143	1 288
Total Central America	**27 639**	**23 837**	**22 411**	**-380**	**-1.5**	**-285**	**-1.2**			
Canada	310 134	310 134	310 134	0	0	0	0	91 951	91 951	91 951
Greenland	n.s.	n.s.	n.s.	0	0	0	0	8	8	8
Mexico	69 016	65 540	64 238	-348	-0.5	-260	-0.4	20 705	20 174	19 908
Saint Pierre and Miquelon	3	3	3	0	0	0	0	-	-	-
United States of America	298 648	302 294	303 089	365	0.1	159	0.1	-	-	-
Total North America	**677 801**	**677 971**	**677 464**	**17**	**n.s.**	**-101**	**n.s.**			
Total North and Central America	**710 790**	**707 514**	**705 849**	**-328**	**-0.05**	**-333**	**-0.05**			
American Samoa	18	18	18	n.s.	-0.2	n.s.	-0.2	-	-	-
Australia	167 904	164 645	163 678	-326	-0.2	-193	-0.1	-	421 590	421 590[c]
Cook Islands	15	16	16	n.s.	0.4	0	0	-	-	-
Fiji	979	1 000	1 000	2	0.2	0	0	-	-	-
French Polynesia	105	105	105	0	0	0	0	-	-	-
Guam	26[b]	26	26	n.s.	n.s.	0	0	-	0	0
Kiribati	2	2	2	0	0	0	0	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	63	63	63	0	0	0	0	-	-	-
Nauru	0	0	0	0	0	0	0	0	0	0
New Caledonia	717	717	717	0	0	0	0	787	787	787
New Zealand	7 720	8 226	8 309	51	0.6	17	0.2	2 557	2 557	2 557
Niue	17	15	14	n.s.	-1.3	n.s.	-1.4	-	-	-
Northern Mariana Islands	35	34	33	n.s.	-0.3	n.s.	-0.3	-	-	-
Palau	38	40	40	n.s.	0.4	n.s.	0.4	-	-	-
Papua New Guinea	31 523	30 132	29 437	-139	-0.5	-139	-0.5	4 474	4 474	4 474

TABLE 4
Change in extent of forest and other wooded land 1990–2005

Country/area	Forest							Other wooded land		
	Area *(1 000 ha)*			Annual change rate				Area *(1 000 ha)*		
	1990	2000	2005	1990–2000		2000–2005		1990	2000	2005
				1 000 ha/year	%[a]	1 000 ha/year	%[a]			
Pitcairn	4	4	4	0	0	0	0	0	0	0
Samoa	130	171	171	4	2.8	0	0	-	22	22
Solomon Islands	2 768	2 371	2 172	-40	-1.5	-40	-1.7	-	-	-
Tokelau	0	0	0	0	0	0	0	0	0	0
Tonga	4	4	4	0	0	0	0	1	1	1
Tuvalu	1	1	1	0	0	0	0	0	0	0
Vanuatu	440	440	440	0	0	0	0	476	476	476
Wallis and Futuna Islands	6	5	5	n.s.	-0.8	n.s.	-2.0	2	1	1
Total Oceania	**212 514**	**208 034**	**206 254**	**-448**	**-0.21**	**-356**	**-0.17**			
Argentina	35 262	33 770	33 021	-149	-0.4	-150	-0.4	60 280	60 734	60 961
Bolivia	62 795	60 091	58 740	-270	-0.4	-270	-0.5	2 473	2 473	2 473
Brazil	520 027	493 213	477 698	-2 681	-0.5	-3 103	-0.6	-	-	-
Chile	15 263	15 834	16 121	57	0.4	57	0.4	16 065	13 806	13 241
Colombia	61 439	60 963	60 728	-48	-0.1	-47	-0.1	18 219	18 158	18 202
Ecuador	13 817	11 841	10 853	-198	-1.5	-198	-1.7	1 201	1 360	1 448
Falkland Islands	0	0	0	0	0	0	0	0	0	0
French Guiana	8 091	8 063	8 063	-3	n.s.	0	0	0	0	0
Guyana	15 104[b]	15 104	15 104	n.s.	n.s.	0	0	-	3 580	3 580
Paraguay	21 157	19 368	18 475	-179	-0.9	-179	-0.9	-	-	-
Peru	70 156	69 213	68 742	-94	-0.1	-94	-0.1	-	22 132	22 132
South Georgia and the South Sandwich Islands	0	0	0	0	0	0	0	0	0	0
Suriname	14 776	14 776	14 776	0	0	0	0	-	-	-
Uruguay	905	1 409	1 506	50	4.5	19	1.3	4	4	4
Venezuela (Bolivarian Republic of)	52 026	49 151	47 713	-288	-0.6	-288	-0.6	7 526	7 421	7 369
Total South America	**890 818**	**852 796**	**831 540**	**-3 802**	**-0.44**	**-4 251**	**-0.50**			
WORLD	**4 077 291**	**3 988 610**	**3 952 025**	**-8 868**	**-0.22**	**-7 317**	**-0.18**			

[a] Rate of gain or loss in percent of the remaining forest area each year within the given period.

[b] FAO estimates based on information provided by these countries for 2000 and 2005.

[c] FAO estimate based on the assumption that the area of other wooded land has been constant since 2000.

TABLE 5

Ownership of forest and other wooded land 2000

Country/area	Forest				Other wooded land			
	Total area (1 000 ha)	Public (%)	Private (%)	Other (%)	Total area (1 000 ha)	Public (%)	Private (%)	Other (%)
Angola	59 728	100	0	0	-	-	-	-
Botswana	12 535	71.0	5.0	24.0	34 791	71.0	5.0	24.0
British Indian Ocean Territory	3	-	-	-	0	-	-	-
Comoros	8	100	0	0	-	-	-	-
Kenya	3 582	97.8	2.2	0	35 120	90.0	10.0	0
Lesotho	7	100	0	0	55	100	0	0
Madagascar	13 023	98.0	2.0	0	18 453	100	0	0
Malawi	3 567	-	-	-	-	-	-	-
Mauritius	38	52.6	47.4	0	17	11.8	88.2	0
Mayotte	6	-	-	-	-	-	-	-
Mozambique	19 512	100	-	-	41 419	100	-	-
Namibia	8 033	-	-	-	8 656	-	-	-
Réunion	87	78.7	21.3	-	54	35.6	64.4	-
Seychelles	40	77.5	22.5	-	-	-	-	-
South Africa	9 203	66.0	34.0	-	21 409	84.3	15.7	-
Swaziland	518	-	-	-	276	-	-	-
Uganda	4 059	29.8	70.2	-	1 235	20.8	79.2	-
United Republic of Tanzania	37 318	99.8	0.2	-	10 629	100	-	-
Zambia	44 676	100	-	-	3 468	-	-	100
Zimbabwe	19 105	-	-	-	-	-	-	-
Total Eastern and Southern Africa	**235 047**	**95.1**	**3.5**	**1.5**	**175 582**	**87.1**	**5.8**	**7.1**
Algeria	2 144	83.7	16.3	-	1 662	100	-	-
Burkina Faso	6 914	-	-	-	7 427	-	-	-
Chad	12 317	100	0	0	9 458	100	0	0
Djibouti	6	-	-	-	220	-	-	-
Egypt	59	50.0	50.0	0	20	100	0	0
Eritrea	1 576	-	-	-	7 361	-	-	-
Ethiopia	13 705	100	0	0	44 650	100	0	0
Libyan Arab Jamahiriya	217	83.9	16.1	0	330	100	0	0
Mali	13 072	100	-	-	16 532	100	-	-
Mauritania	317	97.5	2.5	0	3 110	-	-	-
Morocco	4 328	96.8	0.5	2.7	407	100	0	0
Niger	1 328	100	0	0	4 040	100	0	0
Somalia	7 515	100	-	-	-	-	-	-
Sudan	70 491	97.7	2.3	-	54 153	97.7	2.3	-
Tunisia	959	94.4	5.6	-	177	4.0	96.0	-
Western Sahara	1 011	-	-	-	-	-	-	-
Total Northern Africa	**135 958**	**98.2**	**1.7**	**0.1**	**149 547**	**98.9**	**1.1**	**0**
Benin	2 675	-	-	-	3 836	-	-	-
Burundi	198	-	-	-	722	-	-	-
Cameroon	22 345	100	0	0	14 758	100	0	0
Cape Verde	82	100	0	0	-	-	-	-
Central African Republic	22 903	-	-	-	10 122	-	-	-
Congo	22 556	100	0	0	10 581	100	0	0
Côte d'Ivoire	10 328	100	-	-	2 662	100	-	-
Democratic Republic of the Congo	135 207	100	0	0	83 277	100	0	0

TABLE 5
Ownership of forest and other wooded land 2000

Country/area	Forest				Other wooded land			
	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*
Equatorial Guinea	1 708	-	-	-	22	-	-	-
Gabon	21 826	-	-	-	-	-	-	-
Gambia	461	100	n.s.	0	140	100	0	0
Ghana	6 094	100	0	0	0	-	-	-
Guinea	6 904	-	-	-	5 850	-	-	-
Guinea-Bissau	2 120	84.2	15.8	0	241	-	-	-
Liberia	3 455	-	-	-	0	-	-	-
Nigeria	13 137	100	0	0	6 902	100	0	0
Rwanda	344	77.0	23.0	0	61	77.0	23.0	0
Saint Helena	2	-	-	-	0	-	-	-
Sao Tome and Principe	27	-	-	-	29	-	-	-
Senegal	8 898	100	n.s.	0	5 101	99.9	0.1	0
Sierra Leone	2 851	-	-	-	511	-	-	-
Togo[a]	486	27.0	73.0	-	1 246	27.0	73.0	-
Total Western and Central Africa	**284 608**	**99.7**	**0.3**	**0**	**146 061**	**99.3**	**0.7**	**0**
Total Africa	**655 613**	**97.6**	**1.8**	**0.6**	**471 189**	**94.4**	**2.8**	**2.8**
China	177 001	100	-	-	97 683	100	-	-
Democratic People's Republic of Korea	6 821	100	0	0	-	-	-	-
Japan	24 876	41.9	58.1	0	-	-	-	-
Mongolia	10 665	100	0	0	3 034	100	0	0
Republic of Korea	6 300	30.0	70.0	0	-	-	-	-
Total East Asia	**225 663**	**91.6**	**8.4**	**0**	**100 717**	**100**	**0**	**0**
Bangladesh	884	98.2	1.8	0	53	100	-	-
Bhutan	3 141	100	-	-	609	100	-	-
Brunei Darussalam	288	100	0	-	155	94.8	5.2	-
Cambodia	11 541	100	0	0	298	100	0	0
India	67 554	98.4	1.6	0	4 732	98.4	1.6	0
Indonesia	97 852	100	0	0	-	-	-	-
Lao People's Democratic Republic	16 532	100	0	0	4 053	100	0	0
Malaysia	21 591	93.4	6.6	0	-	-	-	-
Maldives	1	-	-	-	0	-	-	-
Myanmar	34 554	100	0	0	10 629	100	0	0
Nepal	3 900	99.9	0.1	-	1 753	100	-	-
Pakistan	2 116	66.0	34.0	-	1 323	66.0	34.0	-
Philippines	7 949	89.5	10.5	-	3 292	-	-	-
Singapore	2	100	0	0	0	-	-	-
Sri Lanka	2 082	92.5	7.5	-	0	-	-	-
Thailand	14 814	86.8	13.2	-	-	-	-	-
Timor-Leste	854	33.0	67.0	0	-	-	-	-
Viet Nam	11 725	56.1	17.7	26.1	1 816	-	-	-
Total South and Southeast Asia	**297 380**	**96.0**	**3.0**	**1.0**	**28 713**	**97.7**	**2.3**	**0**
Afghanistan	1 015	100	0	0	-	-	-	-
Armenia	305	100	0	0	45	100	0	0
Azerbaijan	936	100	0	0	54	100	0	0

TABLE 5
Ownership of forest and other wooded land 2000

Country/area	Forest				Other wooded land			
	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*
Bahrain	n.s.	100	0	0	0	-	-	-
Cyprus	173	61.2	38.8	0	214	23.7	76.3	0
Georgia	2 760	100	0	0	51	100	0	0
Iran (Islamic Republic of)	11 075	100	0	0	5 340	100	0	0
Iraq	818	100	0	0	1 033	0	0	100
Israel	164	-	-	-	62	-	-	-
Jordan	83	85.5	0	14.5	54	55.6	22.2	22.2
Kazakhstan	3 365	100	0	0	14 765	100	0	0
Kuwait	5	100	0	0	0	-	-	-
Kyrgyzstan	858	100	0	0	303	100	0	0
Lebanon	131	38.2	60.3	1.5	117	13.7	79.9	6.4
Occupied Palestinian Territory	9	-	-	-	-	-	-	-
Oman	2	-	-	100	1 303	100	-	-
Qatar	n.s.	-	-	-	n.s.	-	-	-
Saudi Arabia	2 728	99.3	0.7	0	34 155	99.6	0.4	0
Syrian Arab Republic	432	100	-	-	35	100	-	-
Tajikistan	410	87.8	0	12.2	142	47.2	52.8	0
Turkey	10 052	99.9	0.1	0	10 728	100	n.s.	0
Turkmenistan	4 127	100	0	0	0	-	-	-
United Arab Emirates	310	100	0	0	4	100	0	0
Uzbekistan	3 212	100	0	0	-	-	-	-
Yemen	549	5.0	80.0	15.0	1 406	5.0	80.0	15.0
Total Western and Central Asia	**43 519**	**98.2**	**1.4**	**0.3**	**69 811**	**95.9**	**2.3**	**1.8**
Total Asia	**566 562**	**94.4**	**5.0**	**0.6**	**199 241**	**98.3**	**1.1**	**0.7**
Albania	769	99.1	0.9	0	255	98.8	0.9	0
Andorra	16	-	-	-	-	-	-	-
Austria	3 838	19.6	80.4	0	117	19.7	80.3	0
Belarus	7 848	100	0	0	915	100	0	0
Belgium	667	43.5	56.5	0	27	38.9	61.5	0
Bosnia and Herzegovina	2 185	78.6	21.4	0	549	84.0	16.0	0
Bulgaria	3 375	91.6	8.4	0	105	94.3	4.8	0
Channel Islands	1	-	-	-	0	-	-	-
Croatia	2 129	78.7	21.3	0	338	97.0	2.7	0
Czech Republic	2 637	76.7	23.3	0	0	-	-	-
Denmark	486	28.4	71.6	0	136	-	-	-
Estonia	2 243	37.5	22.4	40.0	94	8.5	37.2	54.3
Faeroe Islands	n.s.	-	-	-	-	-	-	-
Finland	22 475	32.1	67.8	0.1	830	68.9	31.0	0.1
France	15 351	26.0	74.0	-	1 814	9.6	90.4	-
Germany	11 076	52.8	47.2	0	-	-	-	-
Gibraltar	0	-	-	-	0	-	-	-
Greece	3 601	77.5	22.5	0	2 924	86.5	13.5	0
Holy See	0	-	-	-	0	-	-	-
Hungary	1 907	60.5	39.5	0	0	-	-	-
Iceland	38	46.6	53.2	0.8	104	28.9	69.0	2.0
Ireland	609	64.0	36.0	0	41	16.1	83.9	0
Isle of Man	3	-	-	-	0	-	-	-

TABLE 5
Ownership of forest and other wooded land 2000

Country/area	Forest				Other wooded land			
	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*
Italy	9 447	35.0	65.0	0	992	-	-	-
Latvia	2 885	54.0	45.1	0.9	120	16.7	70.8	12.5
Liechtenstein	7	92.8	7.2	0	0	100	0	0
Lithuania	2 020	77.3	22.7	0	83	69.9	30.1	0
Luxembourg	87	45.7	54.3	0	1	10.7	89.3	0
Malta	n.s.	100	0	0	0	-	-	-
Monaco	0	-	-	-	0	-	-	-
Netherlands	360	49.7	50.3	0	0	-	-	-
Norway	9 301	14.0	86.0	0	2 699	29.3	70.7	0
Poland	9 059	83.2	16.8	0	-	-	-	-
Portugal	3 583	7.3	92.7	0	84	22.6	77.4	0
Republic of Moldova	326	100	0	0	31	100	0	0
Romania	6 366	94.3	5.7	0	234	0	100	0
Russian Federation	809 268	100	0	0	72 706	100	0	0
San Marino	n.s.	-	-	-	0	-	-	-
Serbia and Montenegro	2 649	54.0	46.0	0	812	73.0	27.0	0
Slovakia	1 921	52.4	43.2	4.4	-	-	-	-
Slovenia	1 239	27.7	72.3	0	44	4.5	95.0	0
Spain	16 436	30.0	67.9	2.1	11 016	22.3	74.9	2.8
Sweden	27 474	19.7	80.3	0	3 246	55.7	44.3	0
Switzerland	1 199	68.0	32.0	-	64	79.7	20.3	-
The former Yugoslav Republic of Macedonia	906	78.0	22.0	0	82	-	-	100
Ukraine	9 510	100	0	0	41	100	0	0
United Kingdom	2 793	36.2	63.8	0	20	0	100	0
Total Europe	**998 091**	**89.9**	**10.0**	**0.1**	**100 525**	**84.5**	**15.0**	**0.5**
Anguilla	6	-	-	-	-	-	-	-
Antigua and Barbuda	9	-	-	-	16	-	-	-
Aruba	n.s.	-	-	-	0	-	-	-
Bahamas	515	80.0	20.0	-	36	80.1	19.9	-
Barbados	2	4.1	95.9	-	-	-	-	-
Bermuda	1	-	-	-	0	-	-	-
British Virgin Islands	4	-	-	-	2	-	-	-
Cayman Islands	12	-	-	-	4	-	-	-
Cuba	2 435	95.2	2.9	1.9	264	98.1	1.1	1.1
Dominica	47	-	-	-	n.s.	-	-	-
Dominican Republic	1 376	-	-	-	678	-	-	-
Grenada	4	69.0	31.0	-	5	69.0	31.0	-
Guadeloupe	81	47.8	52.2	0	2	100	0	0
Haiti	109	-	-	-	-	-	-	-
Jamaica	341	27.6	65.1	7.3	189	5.1	91.1	3.5
Martinique	46	33.1	66.9	0	-	-	-	-
Montserrat	4	-	-	-	-	-	-	-
Netherlands Antilles	1	-	-	-	33	-	-	-
Puerto Rico	407	-	-	-	-	-	-	-
Saint Kitts and Nevis	5	-	-	-	6	-	-	-
Saint Lucia	17	47.1	52.9	-	5	4.0	96.0	-

TABLE 5
Ownership of forest and other wooded land 2000

Country/area	Forest				Other wooded land			
	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*
Saint Vincent and the Grenadines	10	-	-	-	2	-	-	-
Trinidad and Tobago	228	75.4	24.6	-	72	100	-	-
Turks and Caicos Islands	34	-	-	-	-	-	-	-
United States Virgin Islands	10	-	-	-	-	-	-	-
Total Caribbean	**5 706**	**83.4**	**14.6**	**2.0**	**1 313**	**65.5**	**32.9**	**1.7**
Belize	1 653	-	-	-	115	-	-	-
Costa Rica	2 376	24.3	75.7	-	10	40.0	60.0	-
El Salvador	324	72.5	25.3	2.2	201	72.6	25.4	2.0
Guatemala	4 208	42.2	52.5	5.3	1 672	-	-	-
Honduras	5 430	75.0	25.0	0	559	75.0	25.0	0
Nicaragua	5 539	-	-	-	973	-	-	-
Panama	4 307	9.6	90.4	0	1 143	26.6	73.4	0
Total Central America	**23 837**	**42.5**	**56.1**	**1.4**	**4 673**	**45.6**	**54.2**	**0.2**
Canada	310 134	92.1	7.9	n.s.	91 951	97.9	2.1	0
Greenland	n.s.	-	-	-	8	-	-	-
Mexico	65 540	58.8	-	41.2	20 174	28.0	-	72.0
Saint Pierre and Miquelon	3	86.7	13.3	-	-	-	-	-
United States of America	302 294	42.4	57.6	-	-	-	-	-
Total North America	**677 971**	**66.7**	**29.3**	**4.0**	**112 132**	**85.3**	**1.7**	**13.0**
Total North and Central America	**707 514**	**66.2**	**29.9**	**3.9**	**118 118**	**84.5**	**2.8**	**12.7**
American Samoa	18	-	-	-	-	-	-	-
Australia	164 645	72.0	27.1	0.9	421 590	-	-	-
Cook Islands	16	0	100	0	-	-	-	-
Fiji	1 000	6.8	93.2	0	-	-	-	-
French Polynesia	105	-	-	-	-	-	-	-
Guam	26	-	-	-	0	-	-	-
Kiribati	2	0	100	0	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	63	-	-	-	-	-	-	-
Nauru	0	-	-	-	0	-	-	-
New Caledonia	717	73.8	0.8	25.4	787	76.4	11.8	11.8
New Zealand	8 226	63.4	36.6	0	2 557	-	-	-
Niue	15	0	100	0	-	-	-	-
Northern Mariana Islands	34	-	-	-	-	-	-	-
Palau	40	-	-	-	-	-	-	-
Papua New Guinea	30 132	3.1	0	96.9	4 474	3.1	0	96.9
Pitcairn	4	-	-	-	0	-	-	-
Samoa	171	98.2	1.8	-	22	90.9	9.1	-
Solomon Islands	2 371	-	-	-	-	-	-	-
Tokelau	0	-	-	-	0	-	-	-
Tonga	4	100	-	-	1	-	-	-
Tuvalu	1	-	-	-	0	-	-	-
Vanuatu	440	-	-	-	476	-	-	-
Wallis and Futuna Islands	5	0	0	100	1	0	0	100
Total Oceania	**208 034**	**61.3**	**23.7**	**15.0**	**429 908**	**14.4**	**1.8**	**83.8**

TABLE 5

Ownership of forest and other wooded land 2000

Country/area	Forest				Other wooded land			
	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*	Total area *(1 000 ha)*	Public *(%)*	Private *(%)*	Other *(%)*
Argentina	33 770	-	-	-	60 734	-	-	-
Bolivia	60 091	-	-	-	2 473	-	-	-
Brazil	493 213	-	-	-	-	-	-	-
Chile	15 834	24.9	73.1	2.0	13 806	-	-	-
Colombia	60 963	-	-	-	18 158	-	-	-
Ecuador	11 841	77.1	-	22.9	1 360	-	-	-
Falkland Islands	0	-	-	-	0	-	-	-
French Guiana	8 063	99.8	0.2	0	0	-	-	-
Guyana	15 104	66.3	-	33.7	3 580	66.3	-	33.7
Paraguay	19 368	-	-	-	-	-	-	-
Peru	69 213	83.1	15.2	1.7	22 132	0.8	0.1	99.0
South Georgia and the South Sandwich Islands	0	-	-	-	0	-	-	-
Suriname	14 776	99.7	0.3	-	-	-	-	-
Uruguay	1 409	2.7	97.3	0	4	0	100.0	0
Venezuela (Bolivarian Republic of)	49 151	-	-	-	7 421	-	-	-
Total South America	**852 796**	**75.9**	**17.3**	**6.9**	**129 668**	**9.9**	**0.1**	**89.9**
WORLD	**3 988 610**	**84.4**	**13.3**	**2.4**	**1 448 649**	**89.8**	**3.8**	**6.5**

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 6

Designated functions[a] of forest – primary function 2005

Country/area	Total forest area *(1 000 ha)*	% of total forest whose primary function is designated as:					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Angola	59 104	4.0	-	3.2	-	-	92.9
Botswana	11 943	-	-	-	-	-	-
British Indian Ocean Territory	3	-	-	-	-	-	-
Comoros	5	26.6	73.4	0	0	0	0
Kenya	3 522	n.s.	100	-	-	-	-
Lesotho	8	92.5	-	-	-	-	7.5
Madagascar	12 838	26.3	1.4	39.4	-	32.9	-
Malawi	3 402	-	-	-	-	-	-
Mauritius	37	29.7	43.2	21.6	8.1	-	-
Mayotte	5	-	-	-	-	-	-
Mozambique	19 262	17.5	-	2.3	-	80.2	-
Namibia[b]	7 661	-	-	35.9	-	16.5	47.5
Réunion	84	6.2	14.9	72.0	0.8	0	6.1
Seychelles	40	2.5	15.0	5.0	20.0	15.0	42.5
South Africa	9 203	15.5	-	10.3	-	74.2	-
Swaziland	541	26.8	-	-	-	-	73.0
Uganda	3 627	14.9	-	14.8	-	-	70.2
United Republic of Tanzania	35 257	71.0	-	6.0	-	22.9	-
Zambia	42 452	7.1	4.2	15.0	-	73.7	-
Zimbabwe	17 540	10.1	2.8	-	-	87.1	-
Total Eastern and Southern Africa	**226 534**	**19.4**	**2.8**	**9.5**	**n.s.**	**39.0**	**29.1**
Algeria	2 277	32.9	63.0	4.0	0.1	-	-
Burkina Faso	6 794	8.2	-	0.3	n.s.	-	91.5
Chad	11 921	90.3	0.1	9.6	-	-	-
Djibouti	6	-	-	-	-	-	-
Egypt	67	1.9	50.0	-	-	48.1	-
Eritrea	1 554	1.9	0.9	4.9	-	0.7	91.5
Ethiopia	13 000	3.8	-	-	-	96.2	-
Libyan Arab Jamahiriya	217	-	100	-	-	-	-
Mali	12 572	8.0	69.0	23.0	-	-	-
Mauritania	267	-	-	-	-	-	100
Morocco	4 364	-	-	-	-	-	-
Niger	1 266	-	0.2	17.4	-	82.4	-
Somalia	7 131	n.s.	-	-	-	100	-
Sudan	67 546	44.9	2.6	12.7	-	-	39.9
Tunisia	1 056	23.0	42.0	3.7	-	31.3	-
Western Sahara	1 011	-	-	-	-	-	-
Total Northern Africa	**131 048**	**35.2**	**10.0**	**10.4**	**n.s.**	**16.8**	**27.7**
Benin	2 351	-	-	-	-	-	-
Burundi	152	-	-	-	-	-	-
Cameroon	21 245	29.3	2.7	48.6	1.0	18.4	-
Cape Verde	84	80.0	8.8	11.2	-	-	-
Central African Republic	22 755	21.2	-	78.8	-	-	-
Congo	22 471	88.2	-	4.4	-	7.4	-
Côte d'Ivoire	10 405	88.7	3.3	7.8	0.2	-	-
Democratic Republic of the Congo	133 610	-	-	-	-	-	-

TABLE 6

Designated functions[a] of forest – primary function 2005

Country/area	Total forest area *(1 000 ha)*	% of total forest whose primary function is designated as:					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Equatorial Guinea	1 632	-	-	-	-	-	-
Gabon	21 775	-	-	-	-	-	-
Gambia	471	-	-	-	-	100	-
Ghana	5 517	22.7	6.4	0.8	1.2	-	68.9
Guinea	6 724	1.5	7.3	44.7	-	-	46.5
Guinea-Bissau	2 072	39.6	11.7	45.4	3.4	-	-
Liberia	3 154	41.5	-	4.1	-	48.3	6.2
Nigeria	11 089	27.6	0	49.6	0	0	22.7
Rwanda	480	76.2	10.8	0	0	12.9	0
Saint Helena	2	-	-	-	-	-	-
Sao Tome and Principe	27	-	-	-	-	-	-
Senegal	8 673	59.6	0.4	18.1	n.s.	21.9	-
Sierra Leone	2 754	10.3	1.2	2.8	-	-	85.7
Togo	386	68.0	16.0	16.0	-	-	-
Total Western and Central Africa	**277 829**	**44.6**	**1.9**	**35.0**	**0.3**	**8.1**	**10.1**
Total Africa	**635 412**	**30.3**	**4.6**	**16.4**	**0.1**	**24.8**	**23.8**
China	197 290	58.0	31.3	2.7	1.2	6.8	-
Democratic People's Republic of Korea	6 187	86.2	-	13.8	-	-	-
Japan	24 868	0	0	0	0	100	0
Mongolia	10 252	8.9	44.0	46.2	0.9	-	-
Republic of Korea	6 265	77.8	11.4	7.5	3.3	-	0
Total East Asia	**244 862**	**51.2**	**27.4**	**4.7**	**1.1**	**15.6**	**0**
Bangladesh	871	31.7	7.8	20.9	1.1	38.5	0
Bhutan	3 195	15.9	45.8	27.2	-	-	11.1
Brunei Darussalam	278	62.6	6.8	29.1	1.4	-	-
Cambodia	10 447	32.3	3.9	21.3	0.9	3.9	37.8
India	67 701	21.2	14.8	21.7	-	42.4	-
Indonesia	88 495	53.9	27.5	18.6	-	-	-
Lao People's Democratic Republic	16 142	21.6	54.7	23.5	0.2	-	-
Malaysia	20 890	56.6	18.2	5.4	-	19.8	-
Maldives	1	-	-	-	-	-	-
Myanmar	32 222	77.0	4.7	15.2	-	3.2	-
Nepal	3 636	5.1	12.1	21.4	-	14.7	46.8
Pakistan	1 902	32.0	-	11.4	-	56.7	-
Philippines	7 162	75.0	11.0	12.0	-	-	2.0
Singapore	2	-	-	100	-	-	-
Sri Lanka	1 933	8.8	1.0	28.9	-	61.3	-
Thailand	14 520	13.8	7.6	58.3	-	1.1	19.3
Timor-Leste	798	17.3	59.3	23.4	-	-	-
Viet Nam	12 931	39.8	45.5	14.7	-	-	-
Total South and Southeast Asia	**283 127**	**42.4**	**20.9**	**20.2**	**0.1**	**13.3**	**3.2**
Afghanistan	867	-	-	-	-	100	-
Armenia	283	0	61.8	17.0	21.2	0	0
Azerbaijan	936	0	92.3	7.7	-	0	0

TABLE 6

Designated functions[a] of forest – primary function 2005

Country/area	Total forest area *(1 000 ha)*	% of total forest whose primary function is designated as:					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Bahrain	n.s.	-	100	-	-	-	-
Cyprus[b]	174	24.7	-	2.9	10.3	55.6	5.7
Georgia[b]	2 760	0	78.4	8.2	13.4	0	0
Iran (Islamic Republic of)	11 075	13.5	-	1.4	-	85.1	-
Iraq	822	-	80.0	20.0	-	-	-
Israel	171	-	12.9	4.1	-	83.0	-
Jordan	83	0	6.0	1.2	1.2	91.6	0
Kazakhstan	3 337	0	0	15.9	12.8	71.3	0
Kuwait	6	-	100	-	-	-	-
Kyrgyzstan	869	0	78.0	7.4	1.5	13.1	0
Lebanon	136	97.4	-	2.6	-	-	-
Occupied Palestinian Territory	9	-	-	-	-	-	-
Oman	2	100	-	-	-	-	-
Qatar	n.s.	-	-	-	-	-	-
Saudi Arabia	2 728	-	-	-	-	100	-
Syrian Arab Republic	461	-	-	-	-	100	-
Tajikistan	410	5.4	10.7	83.9	0	0	0
Turkey	10 175	78.3	13.9	7.6	0.2	0	0
Turkmenistan	4 127	0	97.5	2.5	-	0	0
United Arab Emirates	312	-	-	-	-	100	-
Uzbekistan	3 295	0.2	91.5	8.3	-	-	-
Yemen	549	-	-	-	-	100	-
Total Western and Central Asia	**43 588**	**22.2**	**30.0**	**6.4**	**2.1**	**39.3**	**n.s.**
Total Asia	**571 577**	**44.7**	**24.3**	**12.5**	**0.6**	**16.3**	**1.6**
Albania	794	68.3	22.7	9.0	-	-	-
Andorra	16	-	-	-	-	-	-
Austria	3 862	-	-	-	-	-	-
Belarus	7 894	50.6	28.3	5.9	15.2	0	0
Belgium	667	-	-	-	-	100	-
Bosnia and Herzegovina	2 185	56.1	-	-	-	-	43.9
Bulgaria	3 625	-	-	-	-	-	-
Channel Islands	1	-	-	-	-	-	-
Croatia	2 135	94.7	2.3	0.3	0.3	2.4	0
Czech Republic	2 648	75.2	6.3	7.0	11.5	-	0
Denmark	500	38.6	6.8	16.2	-	38.6	-
Estonia	2 284	71.8	22.0	6.2	0	0	0
Faeroe Islands	n.s.	-	-	-	-	-	-
Finland	22 500	91.2	0	7.2	0.2	1.5	0
France	15 554	96.9	1.5	1.2	0.3	-	-
Germany	11 076	-	21.9	19.3	42.3	-	16.5
Gibraltar	0	-	-	-	-	-	-
Greece	3 752	92.1	-	4.2	-	-	3.7
Holy See	0	-	-	-	-	-	-
Hungary	1 976	64.5	13.3	20.6	1.5	0	n.s.
Iceland	46	19.8	10.4	0	14.8	54.1	0
Ireland	669	90.1	0	0.9	-	-	9.0
Isle of Man	3	-	-	-	-	-	-

TABLE 6

Designated functions[a] of forest – primary function 2005

Country/area	Total forest area *(1 000 ha)*	% of total forest whose primary function is designated as:					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Italy	9 979	-	-	29.9	-	-	70.1
Latvia	2 941	n.s.	5.9	13.6	1.5	79.0	0
Liechtenstein	7	40.0	32.0	20.0	8.0	-	-
Lithuania	2 099	70.3	9.8	8.9	3.2	7.8	-
Luxembourg	87	32.6	-	-	-	67.4	-
Malta	n.s.	-	-	-	-	100	-
Monaco	0	-	-	-	-	-	-
Netherlands	365	1.1	0	24.7	-	74.2	-
Norway	9 387	62.9	27.6	1.5	-	8.0	0
Poland	9 192	63.5	20.7	4.8	11.0	0	0
Portugal	3 783	78.0	5.7	16.3	-	-	0
Republic of Moldova	329	64.1	6.7	13.4	-	-	15.8
Romania	6 370	51.3	38.9	4.4	5.4	0	0
Russian Federation	808 790	76.9	8.7	2.0	1.5	10.8	-
San Marino	n.s.	-	-	-	-	-	-
Serbia and Montenegro	2 694	-	-	-	-	-	-
Slovakia	1 929	9.5	17.8	5.0	12.6	55.1	0
Slovenia	1 264	54.3	12.7	6.7	13.9	12.3	0
Spain	17 915	9.4	13.1	37.3	0.1	40.2	0
Sweden	27 528	73.1	0.1	12.2	-	14.5	-
Switzerland	1 221	62.7	35	2.4	0	0	-
The former Yugoslav Republic of Macedonia	906	82.2	-	-	-	-	17.8
Ukraine	9 575	47.9	30.4	2.6	19.0	0	0
United Kingdom	2 845	33.7	0.2	5.1	3.7	53.1	4.2
Total Europe	**1 001 394**	**73.1**	**9.1**	**3.8**	**2.3**	**10.7**	**1.0**
Anguilla	6	-	-	-	-	-	-
Antigua and Barbuda	9	-	-	-	-	-	-
Aruba	n.s.	-	-	-	-	-	-
Bahamas	515	-	-	-	-	-	-
Barbados	2	-	-	17.6	-	-	82.4
Bermuda	1	-	-	-	-	-	-
British Virgin Islands	4	-	-	-	-	-	-
Cayman Islands	12	-	-	-	-	-	-
Cuba	2 713	32.1	45.9	22.0	-	-	-
Dominica	46	-	-	-	-	-	-
Dominican Republic	1 376	-	-	-	-	-	-
Grenada	4	5.1	13.5	56.0	-	-	25.1
Guadeloupe	80	3.5	-	18.5	-	22.7	55.3
Haiti	105	49.8	-	4.1	-	-	46.7
Jamaica	339	2.4	4.5	21.3	0	6.0	65.8
Martinique	46	-	-	-	-	-	-
Montserrat	4	-	-	-	-	-	100
Netherlands Antilles	1	-	-	-	-	-	-
Puerto Rico	408	-	-	-	-	-	-
Saint Kitts and Nevis	5	-	-	-	-	-	-
Saint Lucia	17	-	-	-	-	58.8	41.2

TABLE 6

Designated functions[a] of forest – primary function 2005

Country/area	Total forest area *(1 000 ha)*	% of total forest whose primary function is designated as:					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Saint Vincent and the Grenadines	11	-	-	-	-	-	-
Trinidad and Tobago	226	19.5	13.3	6.2	1.3	0	59.7
Turks and Caicos Islands	34	-	-	-	-	-	-
United States Virgin Islands	10	-	-	-	-	-	-
Total Caribbean	**5 974**	**28.1**	**37.0**	**20.2**	**0.1**	**1.4**	**13.3**
Belize	1 653	-	-	37.0	-	-	63.0
Costa Rica	2 391	0.1	1.9	24.5	-	73.5	-
El Salvador	298	2.0	-	2.3	-	-	95.6
Guatemala	3 938	26.8	-	62.3	-	-	10.9
Honduras	4 648	41.7	1.7	32.5	0.8	23.3	0
Nicaragua	5 189	-	-	35.6	-	64.4	-
Panama	4 294	7.2	21.9	34.0	0	36.8	-
Total Central America	**22 411**	**14.8**	**4.8**	**37.8**	**0.2**	**34.6**	**7.8**
Canada	310 134	1.3	-	4.9	-	86.7	7.1
Greenland	n.s.	-	-	-	-	-	-
Mexico	64 238	0.1	1.5	6.8	-	91.5	-
Saint Pierre and Miquelon	3	-	-	-	-	100	-
United States of America	303 089	12.0	-	19.8	-	68.1	-
Total North America	**677 464**	**6.0**	**0.1**	**11.8**	-	**78.9**	**3.3**
Total North and Central America	**705 849**	**6.4**	**0.5**	**12.6**	**n.s.**	**77.1**	**3.4**
American Samoa	18	-	-	-	-	100	-
Australia	163 678	8.0	-	13.1	-	77.6	1.3
Cook Islands	16	-	7.1	-	-	92.9	-
Fiji	1 000	10.1	33.9	7.4	0	48.7	0
French Polynesia	105	-	-	-	-	-	-
Guam	26	-	-	-	-	100	-
Kiribati	2	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-
Micronesia (Federated States of)	63	-	-	-	-	-	-
Nauru	0	-	-	-	-	-	-
New Caledonia	717	2.8	14.4	9.9	8.4	2.8	61.8
New Zealand	8 309	22.0	0.2	77.7	-	-	-
Niue	14	-	-	-	-	-	100
Northern Mariana Islands	33	-	-	-	-	100	-
Palau	40	-	-	-	-	100	-
Papua New Guinea	29 437	24.8	-	4.6	-	4.9	65.7
Pitcairn	4	-	-	-	-	-	-
Samoa	171	47.1	20.4	16.7	4.2	5.0	6.7
Solomon Islands	2 172	-	-	-	-	-	-
Tokelau	0	-	-	-	-	-	-
Tonga	4	0.6	-	-	-	-	99.4
Tuvalu	1	-	-	-	-	-	-
Vanuatu	440	-	-	-	-	-	-
Wallis and Futuna Islands	5	10.8	80.1	9.1	-	-	-
Total Oceania	**206 254**	**11.0**	**0.2**	**14.4**	**n.s.**	**63.5**	**10.8**

TABLE 6

Designated functions[a] of forest – primary function 2005

Country/area	Total forest area *(1 000 ha)*	% of total forest whose primary function is designated as:					
		Production	Protection	Conservation	Social services	Multiple purpose	None or unknown
Argentina	33 021	3.7	-	3.4	-	6.3	86.5
Bolivia	58 740	0	0	20.0	0	80.0	0
Brazil	477 698	5.5	17.8	8.1	23.8	44.8	-
Chile	16 121	45.3	30.0	13.7	0	11.1	-
Colombia	60 728	12.7	1.0	14.1	0	-	72.2
Ecuador	10 853	1.5	21.5	44.2	-	18.9	13.8
Falkland Islands	0	-	-	-	-	-	-
French Guiana	8 063	0	0	4.0	0	31.5	64.4
Guyana	15 104	34.9	-	1.0	2.4	-	61.7
Paraguay	18 475	0.2	n.s.	10.0	n.s.	0	89.8
Peru	68 742	36.7	0.5	26.9	n.s.	26.0	9.9
South Georgia and the South Sandwich Islands	0	-	-	-	-	-	-
Suriname	14 776	27.1	-	12.8	-	3.3	56.8
Uruguay	1 506	59.7	23.0	17.2	-	-	-
Venezuela (Bolivarian Republic of)	47 713	38.1	0	61.9	0	0	-
Total South America	**831 540**	**11.6**	**11.3**	**14.4**	**13.7**	**34.6**	**14.5**
WORLD	**3 952 025**	**34.1**	**9.3**	**11.2**	**3.7**	**33.8**	**7.8**

[a] Designated function is defined as "the function or purpose assigned to a piece of land either by legal prescriptions or by the land owner/manager".

[b] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 7

Designated functions of forest – total area with function[a] 2005 *(1 000 ha)*

Country/area	Total forest area	Production	Protection	Conservation	Social services
Angola	59 104	-	-	-	-
Botswana	11 943	-	-	-	-
British Indian Ocean Territory	3	-	-	-	-
Comoros	5	-	-	-	-
Kenya	3 522	-	-	-	-
Lesotho	8	-	-	-	-
Madagascar	12 838	-	-	-	-
Malawi	3 402	-	-	-	-
Mauritius	37	11	18	10	6
Mayotte	5	-	-	-	-
Mozambique	19 262	-	-	-	-
Namibia	7 661	-	-	-	-
Réunion	84	-	-	-	-
Seychelles	40	7	12	2	8
South Africa	9 203	-	-	-	-
Swaziland	541	-	-	-	-
Uganda	3 627	-	-	-	-
United Republic of Tanzania	35 257	-	-	-	-
Zambia	42 452	-	-	10 260	-
Zimbabwe	17 540	-	-	-	-
Total Eastern and Southern Africa	**226 534**				
Algeria[b]	2 277	-	-	-	-
Burkina Faso	6 794	-	-	-	-
Chad	11 921	-	-	-	-
Djibouti	6	-	-	-	-
Egypt	67	67	67	-	-
Eritrea	1 554	33	32	104	-
Ethiopia	13 000	-	-	-	-
Libyan Arab Jamahiriya	217	-	217	-	-
Mali	12 572	-	-	-	-
Mauritania	267	-	-	-	-
Morocco	4 364	-	-	-	-
Niger	1 266	1 116	1 118	220	-
Somalia	7 131	-	-	-	-
Sudan	67 546	-	-	-	-
Tunisia	1 056	574	1 056	1 056	-
Western Sahara	1 011	-	-	-	-
Total Northern Africa	**131 048**				
Benin	2 351	-	-	-	-
Burundi	152	-	-	-	-
Cameroon	21 245	14 440	736	6 289	210
Cape Verde	84	-	-	-	-
Central African Republic	22 755	4 826	-	17 926	-
Congo	22 471	-	-	-	-
Côte d'Ivoire	10 405	10 409	348	808	17
Democratic Republic of the Congo	133 610	-	-	-	-
Equatorial Guinea	1 632	-	-	-	-

TABLE 7

Designated functions of forest – total area with function[a] 2005 *(1 000 ha)*

Country/area	Total forest area	Production	Protection	Conservation	Social services
Gabon	21 775	-	-	-	-
Gambia	471	-	-	-	-
Ghana	5 517	1 255	353	43	66
Guinea	6 724	-	-	-	-
Guinea-Bissau	2 072	-	-	-	-
Liberia	3 154	-	-	-	-
Nigeria	11 089	-	-	-	-
Rwanda	480	-	-	-	-
Saint Helena	2	-	-	-	-
Sao Tome and Principe	27	-	-	-	-
Senegal	8 673	6 617	47	2 007	0
Sierra Leone	2 754	317	32	77	-
Togo	386	-	-	-	-
Total Western and Central Africa	**277 829**				
Total Africa	**635 412**				
China	197 290	189 544	185 854	82 924	15 739
Democratic People's Republic of Korea	6 187	5 335	6 187	852	852
Japan	24 868	23 743	24 868	24 868	24 868
Mongolia	10 252	912	9 248	9 248	4 825
Republic of Korea	6 265	4 874	1 186	1 186	675
Total East Asia	**244 862**				
Bangladesh	871	612	250	250	527
Bhutan	3 195	508	2 333	2 333	869
Brunei Darussalam	278	174	100	100	282
Cambodia	10 447	3 778	3 031	2 627	501
India	67 701	43 036	67 701	53 364	67 701
Indonesia	88 495	47 707	40 788	40 788	-
Lao People's Democratic Republic	16 142	3 488	12 654	12 622	3 822
Malaysia	20 890	15 960	19 661	4 930	1 120
Maldives	1	-	-	-	-
Myanmar	32 222	25 822	7 425	7 425	7 425
Nepal	3 636	718	1 749	1 216	776
Pakistan	1 902	1 686	1 294	216	216
Philippines	7 162	5 372	1 647	1 647	859
Singapore	2	-	2	2	2
Sri Lanka	1 933	1 356	1 762	1 762	1 743
Thailand	14 520	2 150	9 725	9 572	8 623
Timor-Leste	798	138	660	660	-
Viet Nam	12 931	5 148	12 931	7 783	1 902
Total South and Southeast Asia	**283 127**				
Afghanistan	867	867	867	867	867
Armenia	283	9	241	131	110
Azerbaijan	936	151	889	72	-
Bahrain	n.s.	-	n.s.	-	-
Cyprus[b]	174	43	163	163	115
Georgia	2 760	550	2 760	2 700	370

TABLE 7

Designated functions of forest – total area with function[a] 2005 *(1 000 ha)*

Country/area	Total forest area	Production	Protection	Conservation	Social services
Iran (Islamic Republic of)	11 075	-	-	-	-
Iraq	822	-	-	-	-
Israel	171	60	-	-	-
Jordan	83	-	-	-	-
Kazakhstan	3 337	-	-	530	428
Kuwait	6	-	6	-	-
Kyrgyzstan	869	562	869	64	869
Lebanon	136	133	136	4	136
Occupied Palestinian Territory	9	-	-	-	-
Oman	2	2	-	-	-
Qatar	n.s.	-	-	-	-
Saudi Arabia	2 728	-	-	-	-
Syrian Arab Republic	461	-	-	-	-
Tajikistan	410	22	44	344	-
Turkey	10 175	-	-	-	-
Turkmenistan	4 127	4 023	4 023	104	-
United Arab Emirates	312	-	312	312	-
Uzbekistan	3 295	3 020	3 289	3 289	-
Yemen	549	-	-	-	-
Total Western and Central Asia	**43 588**				
Total Asia	**571 577**				
Albania	794	542	180	71	-
Andorra	16	-	-	-	-
Austria[b]	3 862	-	3 862	3 862	-
Belarus	7 894	3 996	7 894	466	7 894
Belgium	667	667	99	209	-
Bosnia and Herzegovina	2 185	-	-	-	-
Bulgaria	3 625	-	-	-	-
Channel Islands	1	-	-	-	-
Croatia	2 135	2 049	504	482	667
Czech Republic	2 648	2 860	726	656	605
Denmark	500	494	322	81	-
Estonia	2 284	1 639	503	142	-
Faeroe Islands	n.s.	-	-	-	-
Finland	22 500	20 888	0	22 500	22 500
France	15 554	-	-	-	-
Germany	11 076	-	-	-	-
Gibraltar	0	-	-	-	-
Greece	3 752	-	-	-	-
Holy See	0	-	-	-	-
Hungary	1 976	1 338	292	425	34
Iceland	46	41	36	36	36
Ireland	669	-	-	-	-
Isle of Man	3	-	-	-	-
Italy	9 979	-	8 921	2 980	9 979
Latvia	2 941	-	-	-	-
Liechtenstein	7	-	-	-	-
Lithuania	2 099	1 823	206	2 099	2 099

TABLE 7

Designated functions of forest – total area with function[a] 2005 *(1 000 ha)*

Country/area	Total forest area	Production	Protection	Conservation	Social services
Luxembourg	87	-	-	-	-
Malta	n.s.	-	-	-	-
Monaco	0	-	-	-	-
Netherlands	365	279	0	301	301
Norway	9 387	6 656	2 593	9 387	9 387
Poland	9 192	8 701	-	-	-
Portugal	3 783	-	-	-	-
Republic of Moldova	329	-	-	-	-
Romania	6 370	5 102	2 481	854	1 000
Russian Federation	808 790	-	-	-	-
San Marino	n.s.	-	-	-	-
Serbia and Montenegro	2 694	-	-	-	-
Slovakia	1 929	-	-	-	-
Slovenia	1 264	1 171	443	281	441
Spain	17 915	1 971	10 991	13 872	913
Sweden	27 528	20 126	35	27 528	27 528
Switzerland	1 221	1 192	427	29	-
The former Yugoslav Republic of Macedonia	906	-	-	-	-
Ukraine	9 575	5 451	9 575	1 436	4 788
United Kingdom	2 845	2 361	280	521	1 562
Total Europe	**1 001 394**				
Anguilla	6	-	-	-	-
Antigua and Barbuda	9	-	-	-	-
Aruba	n.s.	-	-	-	-
Bahamas	515	-	-	-	-
Barbados	2	-	-	-	-
Bermuda	1	-	-	-	-
British Virgin Islands	4	-	-	-	-
Cayman Islands	12	-	-	-	-
Cuba	2 713	-	-	-	-
Dominica	46	-	-	-	-
Dominican Republic	1 376	-	-	-	-
Grenada	4	-	-	-	-
Guadeloupe	80	3	80	33	33
Haiti	105	52	4	4	4
Jamaica	339	43	116	93	93
Martinique	46	-	-	-	-
Montserrat	4	-	-	-	-
Netherlands Antilles	1	-	-	-	-
Puerto Rico	408	-	-	-	-
Saint Kitts and Nevis	5	-	-	-	-
Saint Lucia	17	-	-	-	-
Saint Vincent and the Grenadines	11	-	-	-	-
Trinidad and Tobago	226	-	-	-	-
Turks and Caicos Islands	34	-	-	-	-
United States Virgin Islands	10	-	-	-	-
Total Caribbean	**5 974**				

TABLE 7

Designated functions of forest – total area with function[a] 2005 *(1 000 ha)*

Country/area	Total forest area	Production	Protection	Conservation	Social services
Belize	1 653	-	-	-	-
Costa Rica	2 391	-	-	-	-
El Salvador	298	-	-	-	-
Guatemala	3 938	-	-	-	-
Honduras	4 648	-	-	-	-
Nicaragua	5 189	-	-	-	-
Panama	4 294	312	3 133	2 827	-
Total Central America	**22 411**				
Canada	310 134	272 827	310 134	310 134	-
Greenland	n.s.	-	-	-	-
Mexico	64 238	-	-	-	-
Saint Pierre and Miquelon	3	3	2	1	3
United States of America	303 089	-	303 089	-	-
Total North America	**677 464**				
Total North and Central America	**705 849**				
American Samoa	18	18	18	18	18
Australia	163 678	-	-	-	-
Cook Islands	16	16	16	14	-
Fiji	1 000	588	368	209	517
French Polynesia	105	-	-	-	-
Guam	26	-	-	-	-
Kiribati	2	-	-	-	-
Marshall Islands	-	-	-	-	-
Micronesia (Federated States of)	63	-	-	-	-
Nauru	0	-	-	-	-
New Caledonia	717	133	133	91	60
New Zealand	8 309	1 852	8 309	8 309	8 309
Niue	14	-	-	-	-
Northern Mariana Islands	33	-	-	-	-
Palau	40	-	-	-	-
Papua New Guinea	29 437	-	-	-	-
Pitcairn	4	-	-	-	-
Samoa	171	89	60	75	51
Solomon Islands	2 172	-	-	-	-
Tokelau	0	-	-	-	-
Tonga	4	-	-	-	-
Tuvalu	1	-	-	-	-
Vanuatu	440	-	-	-	-
Wallis and Futuna Islands	5	4	5	2	-
Total Oceania	**206 254**				
Argentina	33 021	-	-	-	-
Bolivia	58 740	30 555	-	58 740	-
Brazil	477 698	41 122	85 149	258 334	128 428
Chile	16 121	-	-	-	-
Colombia	60 728	-	-	-	-
Ecuador	10 853	-	-	-	-

TABLE 7

Designated functions of forest – total area with function[a] 2005 *(1 000 ha)*

Country/area	Total forest area	Production	Protection	Conservation	Social services
Falkland Islands	0	-	-	-	-
French Guiana	8 063	1 217	55	1 261	335
Guyana	15 104	-	-	-	-
Paraguay	18 475	-	-	-	-
Peru	68 742	-	-	-	-
South Georgia and the South Sandwich Islands	0	-	-	-	-
Suriname	14 776	-	-	-	-
Uruguay	1 506	-	-	-	-
Venezuela (Bolivarian Republic of)	47 713	-	-	-	-
Total South America	**831 540**				
WORLD	**3 952 025**				

[a] "Total area with function" represents the total area having a specific function, regardless of whether it is a primary function or not.

[b] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 8

Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Country/area	Forest					
	Total area	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation
Angola	59 104	0	58 973	0	131	0
Botswana	11 943	-	-	-	-	-
British Indian Ocean Territory	3	-	-	-	-	-
Comoros	5	0	4	0	1	-
Kenya	3 522	704	2 616	-	202	-
Lesotho	8	1	-	-	7	-
Madagascar	12 838	10 347	2 198	-	234	59
Malawi	3 402	1 132	2 067	-	204	-
Mauritius	37	0	22	n.s.	11	4
Mayotte	5	-	5	-	n.s.	-
Mozambique	19 262	-	19 224	-	38	-
Namibia	7 661	-	7 661	-	-	-
Réunion	84	55	6	18	2	2
Seychelles	40	2	33	-	5	-
South Africa	9 203	-	7 777	-	1 426	-
Swaziland	541	-	395	31	114	-
Uganda	3 627	-	3 591	-	36	-
United Republic of Tanzania	35 257	-	35 107	-	150	-
Zambia	42 452	-	42 377	-	75	-
Zimbabwe	17 540	-	17 385	-	154	-
Total Eastern and Southern Africa	**226 534**					
Algeria	2 277	-	1 206	316	12	742
Burkina Faso	6 794	0	5 918	800	71	5
Chad	11 921	190	11 716	-	-	15
Djibouti	6	-	-	-	-	-
Egypt	67	-	-	-	1	66
Eritrea	1 554	-	1 526	-	14	14
Ethiopia	13 000	-	12 509	-	491	-
Libyan Arab Jamahiriya	217	-	-	-	-	217
Mali	12 572	-	-	-	-	-
Mauritania	267	-	-	-	-	-
Morocco	4 364	-	3 754	47	563	-
Niger	1 266	220	936	-	-	110
Somalia	7 131	-	7 128	-	3	-
Sudan	67 546	13 509	47 282	1 351	4 728	675
Tunisia	1 056	-	320	238	150	348
Western Sahara	1 011	-	-	-	-	-
Total Northern Africa	**131 048**					
Benin	2 351	-	2 237	-	114	-
Burundi	152	0	67	0	86	0
Cameroon	21 245	-	-	-	-	-
Cape Verde	84	-	-	-	67	17
Central African Republic	22 755	-	22 750	-	5	-
Congo	22 471	7 464	14 957	-	51	-
Côte d'Ivoire	10 405	625	9 443	0	337	0
Democratic Republic of the Congo	133 610	-	-	-	-	-

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Total area	Other wooded land					Country/area
	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	
-	-	-	-	-	-	Angola
34 791	-	-	-	-	-	Botswana
0	-	-	-	-	-	British Indian Ocean Territory
-	-	-	-	-	-	Comoros
34 920	-	34 920	-	-	-	Kenya
31	-	31	-	-	-	Lesotho
17 054	-	-	-	-	-	Madagascar
-	-	-	-	-	-	Malawi
15	0	15	n.s.	-	-	Mauritius
-	-	-	-	-	-	Mayotte
40 919	-	40 919	-	-	-	Mozambique
8 473	-	8 473	-	-	-	Namibia
55	16	8	31	0	0	Réunion
-	-	-	-	-	-	Seychelles
21 409	0	21 409	0	0	0	South Africa
289	-	289	-	-	-	Swaziland
1 150	-	1 150	-	-	-	Uganda
4 756	-	4 756	-	-	-	United Republic of Tanzania
3 161	-	3 161	-	-	-	Zambia
-	-	-	-	-	-	Zimbabwe
167 023						**Total Eastern and Southern Africa**
1 595	-	1 595	-	-	-	Algeria
7 427	-	7 427	-	-	-	Burkina Faso
9 152	-	9 152	-	-	-	Chad
220	-	-	-	-	-	Djibouti
20	-	20	-	-	-	Egypt
7 257	-	7 257	-	-	-	Eritrea
44 650	-	44 650	-	-	-	Ethiopia
330	-	330	-	-	-	Libyan Arab Jamahiriya
16 532	-	16 532	-	-	-	Mali
3 110	-	-	-	-	-	Mauritania
406	-	406	-	-	-	Morocco
3 740	-	3 740	-	-	-	Niger
-	-	-	-	-	-	Somalia
-	-	-	-	-	-	Sudan
170	-	170	-	-	-	Tunisia
-	-	-	-	-	-	Western Sahara
94 609						**Total Northern Africa**
3 959	-	-	-	-	-	Benin
722	-	-	-	-	-	Burundi
14 758	-	-	-	-	-	Cameroon
-	-	-	-	-	-	Cape Verde
10 122	-	-	-	-	-	Central African Republic
10 547	-	10 547	-	-	-	Congo
2 626	0	2 626	0	0	0	Côte d'Ivoire
83 277	-	-	-	-	-	Democratic Republic of the Congo

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Country/area	Forest					
	Total area	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation
Equatorial Guinea	1 632	-	-	-	-	-
Gabon	21 775	-	-	-	36	-
Gambia	471	-	471	-	n.s.	-
Ghana	5 517	353	5 004	-	160	-
Guinea	6 724	63	6 568	60	30	3
Guinea-Bissau	2 072	940	1 132	-	0	n.s.
Liberia	3 154	129	3 017	-	8	-
Nigeria	11 089	326	10 414	0	349	0
Rwanda	480	0	62	-	367	52
Saint Helena	2	-	-	-	-	-
Sao Tome and Principe	27	12	16	-	-	-
Senegal	8 673	1 598	6 710	-	332	33
Sierra Leone	2 754	-	2 751	-	3	-
Togo	386	0	348	-	30	8
Total Western and Central Africa	**277 829**					
Total Africa	**635 412**					
China	197 290	11 632	114 332	39 957	28 530	2 839
Democratic People's Republic of Korea	6 187	852	-	5 335	-	-
Japan	24 868	4 591	9 955	-	-	10 321
Mongolia	10 252	4 733	5 407	-	112	-
Republic of Korea	6 265	-	4 901	-	1 364	-
Total East Asia	**244 862**					
Bangladesh	871	-	592	-	195	84
Bhutan	3 195	413	2 529	251	2	0
Brunei Darussalam	278	278	-	-	-	-
Cambodia	10 447	322	10 066	0	59	-
India	67 701	-	32 943	31 532	1 053	2 173
Indonesia	88 495	48 702	-	36 394	3 399	-
Lao People's Democratic Republic	16 142	1 490	14 428	-	223	1
Malaysia	20 890	3 820	-	15 497	1 573	-
Maldives	1	-	-	-	-	-
Myanmar	32 222	-	31 373	-	696	153
Nepal	3 636	349	384	2 850	43	10
Pakistan	1 902	-	1 584	-	318	-
Philippines	7 162	829	5 713	-	304	316
Singapore	2	2	0	0	0	0
Sri Lanka	1 933	167	1 571	-	171	24
Thailand	14 520	6 451	4 970	-	1 997	1 102
Timor-Leste	798	-	755	-	-	43
Viet Nam	12 931	85	10 151	-	1 792	903
Total South and Southeast Asia	**283 127**					
Afghanistan	867	-	867	-	-	-
Armenia	283	14	259	0	0	10
Azerbaijan	936	400	516	-	-	20

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Total area	Other wooded land					Country/area
	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	
31	-	-	-	-	-	Equatorial Guinea
-	-	-	-	-	-	Gabon
125	-	125	-	-	-	Gambia
0	-	-	-	-	-	Ghana
5 850	-	-	-	-	-	Guinea
236	-	-	-	-	-	Guinea-Bissau
0	-	-	-	-	-	Liberia
5 495	0	5 495	-	0	0	Nigeria
61	-	61	-	-	-	Rwanda
0	-	-	-	-	-	Saint Helena
29	-	-	-	-	-	Sao Tome and Principe
5 001	600	4 352	-	0	49	Senegal
384	-	198	-	-	-	Sierra Leone
1 246	0	1 246	-	-	-	Togo
144 468						**Total Western and Central Africa**
406 100						**Total Africa**
87 615	-	71 421	16 194	-	-	China
-	-	-	-	-	-	Democratic People's Republic of Korea
-	-	-	-	-	-	Japan
2 388	1 102	1 273	-	-	13	Mongolia
-	-	-	-	-	-	Republic of Korea
90 003						**Total East Asia**
58	-	-	-	-	-	Bangladesh
611	98	417	96	0	0	Bhutan
160	-	-	156	3	1	Brunei Darussalam
270	-	270	-	-	-	Cambodia
4 110	-	2 046	1 745	104	215	India
-	-	-	-	-	-	Indonesia
4 643	-	-	-	-	-	Lao People's Democratic Republic
-	-	-	-	-	-	Malaysia
0	-	-	-	-	-	Maldives
10 834	-	10 834	-	-	-	Myanmar
1 897	-	-	1 897	-	-	Nepal
1 389	-	1 389	-	-	-	Pakistan
3 611	-	-	-	-	-	Philippines
0	-	-	-	-	-	Singapore
0	-	-	-	-	-	Sri Lanka
-	-	-	-	-	-	Thailand
-	-	-	-	-	-	Timor-Leste
2 259	-	-	-	-	-	Viet Nam
29 842						**Total South and Southeast Asia**
-	-	-	-	-	-	Afghanistan
45	-	42	0	0	3	Armenia
54	15	39	0	0	0	Azerbaijan

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Country/area	Forest					
	Total area	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation
Bahrain	n.s.	-	-	-	-	n.s.
Cyprus	174	22	111	36	0	5
Georgia	2 760	500	2 200	0	0	60
Iran (Islamic Republic of)	11 075	200	10 031	228	616	-
Iraq	822	0	809	0	0	13
Israel	171	-	70	-	-	101
Jordan	83	0	37	6	0	40
Kazakhstan	3 337	0	2 428	0	0	909
Kuwait	6	-	-	-	-	6
Kyrgyzstan	869	241	562	-	24	42
Lebanon	136	0	129	0	8	0
Occupied Palestinian Territory	9	-	-	-	-	-
Oman	2	-	-	-	-	2
Qatar	n.s.	-	-	-	-	-
Saudi Arabia	2 728	-	2 728	-	-	-
Syrian Arab Republic	461	-	198	-	-	264
Tajikistan	410	297	12	35	22	44
Turkey	10 175	975	5 925	738	1 916	621
Turkmenistan	4 127	104	4 023	-	0	-
United Arab Emirates	312	0	0	0	0	312
Uzbekistan	3 295	57	2 643	534	5	56
Yemen	549	-	161	388	-	-
Total Western and Central Asia	**43 588**					
Total Asia	**571 577**					
Albania	794	85	621	0	3	86
Andorra	16	-	-	-	-	-
Austria	3 862	-	-	-	-	-
Belarus	7 894	400	5 712	1 780	2	-
Belgium	667	0	0	392	275	0
Bosnia and Herzegovina	2 185	2	1 184	857	142	-
Bulgaria	3 625	-	-	-	-	-
Channel Islands	1	-	-	-	-	-
Croatia	2 135	10	2 063	0	61	0
Czech Republic	2 648	0	14	2 634	0	0
Denmark	500	0	6	179	281	34
Estonia	2 284	142	1 390	751	1	0
Faeroe Islands	n.s.	-	-	-	-	-
Finland	22 500	1 419	0	21 081	0	0
France	15 554	30	-	13 556	1 968	-
Germany	11 076	0	0	11 076	0	0
Gibraltar	0	-	-	-	-	-
Greece	3 752	0	3 618	0	0	134
Holy See	0	-	-	-	-	-
Hungary	1 976	0	415	1 016	454	91
Iceland	46	0	17	0	17	12
Ireland	669	0	0	90	579	0
Isle of Man	3	-	-	-	-	-

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Total area	Other wooded land					Country/area
	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	
0	-	-	-	-	-	Bahrain
214	-	214	-	-	-	Cyprus
50	0	50	0	0	0	Georgia
5 340	-	5 340	-	-	-	Iran (Islamic Republic of)
927	0	927	0	0	0	Iraq
85	-	85	-	-	-	Israel
52	0	42	10	0	-	Jordan
15 622	0	15 561	0	0	61	Kazakhstan
0	-	-	-	-	-	Kuwait
313	-	-	-	-	-	Kyrgyzstan
106	0	106	0	0	0	Lebanon
-	-	-	-	-	-	Occupied Palestinian Territory
1 303	-	1 303	-	-	-	Oman
n.s.	-	-	-	-	-	Qatar
34 155	-	34 155	-	-	-	Saudi Arabia
35	-	35	-	-	-	Syrian Arab Republic
142	0	10	10	0	122	Tajikistan
10 689	359	2 256	-	-	-	Turkey
0	0	0	0	0	0	Turkmenistan
4	4	0	0	0	0	United Arab Emirates
904	-	904	-	-	-	Uzbekistan
1 406	-	1 406	-	-	-	Yemen
71 446						**Total Western and Central Asia**
191 291						**Total Asia**
261	0	261	0	n.s.	0	Albania
-	-	-	-	-	-	Andorra
118	-	118	-	-	-	Austria
914	0	714	200	0	-	Belarus
27	0	0	27	0	0	Belgium
549	-	549	-	-	-	Bosnia and Herzegovina
27	0	0	27	0	0	Bulgaria
0	-	-	-	-	-	Channel Islands
346	2	344	0	0	0	Croatia
0	-	-	-	-	-	Czech Republic
136	-	-	-	-	-	Denmark
82	0	82	0	0	0	Estonia
-	-	-	-	-	-	Faeroe Islands
802	326	0	476	0	0	Finland
1 708	-	-	1 708	-	-	France
-	-	-	-	-	-	Germany
0	-	-	-	-	-	Gibraltar
2 780	0	2 780	0	0	0	Greece
0	-	-	-	-	-	Holy See
0	0	0	0	0	0	Hungary
104	0	104	0	0	0	Iceland
41	1	40	0	0	0	Ireland
0	-	-	-	-	-	Isle of Man

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Country/area	Forest					
	Total area	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation
Italy	9 979	-	-	-	146	-
Latvia	2 941	14	2 282	644	1	0
Liechtenstein	7	2	5	-	n.s.	-
Lithuania	2 099	26	1 548	384	100	41
Luxembourg	87	-	-	58	28	-
Malta	n.s.	0	0	0	0	n.s.
Monaco	0	-	-	-	-	-
Netherlands	365	0	0	361	4	0
Norway	9 387	250	-	8 875	262	-
Poland	9 192	53	-	9 107	32	-
Portugal	3 783	55	-	2 494	1 067	167
Republic of Moldova	329	0	328	0	1	0
Romania	6 370	233	651	5 339	92	57
Russian Federation	808 790	255 470	536 358	-	11 888	5 075
San Marino	n.s.	-	-	-	-	-
Serbia and Montenegro	2 694	4	115	2 536	39	0
Slovakia	1 929	24	946	940	17	2
Slovenia	1 264	119	1 107	38	0	0
Spain	17 915	812	11 582	4 050	1 471	0
Sweden	27 528	4 726	-	22 135	667	0
Switzerland	1 221	14	15	1 188	4	0
The former Yugoslav Republic of Macedonia	906	0	876	-	30	-
Ukraine	9 575	59	4 729	4 399	81	307
United Kingdom	2 845	0	646	275	1 902	22
Total Europe	**1 001 394**					
Anguilla	6	-	-	-	-	-
Antigua and Barbuda	9	-	-	-	-	-
Aruba	n.s.	-	-	-	-	-
Bahamas	515	-	515	-	0	0
Barbados	2	-	2	-	-	-
Bermuda	1	-	-	-	-	-
British Virgin Islands	4	-	-	-	-	-
Cayman Islands	12	-	-	-	-	-
Cuba	2 713	-	2 319	-	230	164
Dominica	46	27	19	0	n.s.	-
Dominican Republic	1 376	-	-	-	-	-
Grenada	4	1	3	-	n.s.	-
Guadeloupe	80	19	58	2	1	0
Haiti	105	-	81	-	24	-
Jamaica	339	-	325	-	8	6
Martinique	46	-	45	-	1	-
Montserrat	4	-	4	-	-	-
Netherlands Antilles	1	-	-	-	-	-
Puerto Rico	408	-	-	-	-	-
Saint Kitts and Nevis	5	-	-	-	-	-
Saint Lucia	17	-	-	-	-	-

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Total area	Other wooded land					Country/area
	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	
1 047	-	-	-	-	-	Italy
115	-	-	-	-	-	Latvia
0	n.s.	n.s.	-	-	-	Liechtenstein
77	-	77	-	-	-	Lithuania
1	-	-	-	-	-	Luxembourg
0	-	-	-	-	-	Malta
0	-	-	-	-	-	Monaco
0	-	-	-	-	-	Netherlands
2 613	261	2 352	0	0	-	Norway
-	-	-	-	-	-	Poland
84	44	40	-	0	-	Portugal
31	0	31	0	0	0	Republic of Moldova
258	-	-	-	-	-	Romania
74 185	73 169	-	0	0	1 016	Russian Federation
0	-	-	-	-	-	San Marino
808	0	686	122	0	0	Serbia and Montenegro
-	-	-	-	-	-	Slovakia
44	-	-	-	-	-	Slovenia
10 299	0	10 299	0	0	0	Spain
3 257	3 166	91	0	0	0	Sweden
67	0	0	67	0	0	Switzerland
82	0	82	-	-	-	The former Yugoslav Republic of Macedonia
41	0	20	20	0	0	Ukraine
20	0	10	10	0	0	United Kingdom
100 925						**Total Europe**
-	-	-	-	-	-	Anguilla
16	-	-	-	-	-	Antigua and Barbuda
0	-	-	-	-	-	Aruba
36	-	36	-	0	0	Bahamas
-	-	-	-	-	-	Barbados
0	-	-	-	-	-	Bermuda
2	-	-	-	-	-	British Virgin Islands
4	-	-	-	-	-	Cayman Islands
260	-	-	-	170	90	Cuba
n.s.	n.s.	-	-	0	-	Dominica
678	-	-	-	-	-	Dominican Republic
5	-	-	-	-	-	Grenada
2	2	0	0	0	0	Guadeloupe
-	-	-	-	-	-	Haiti
188	-	167	-	-	21	Jamaica
-	-	-	-	-	-	Martinique
-	-	-	-	-	-	Montserrat
33	-	-	-	-	-	Netherlands Antilles
-	-	-	-	-	-	Puerto Rico
6	-	-	-	-	-	Saint Kitts and Nevis
5	-	-	-	-	-	Saint Lucia

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Country/area	Forest					
	Total area	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation
Saint Vincent and the Grenadines	11	-	10	-	n.s.	-
Trinidad and Tobago	226	14	197	0	15	0
Turks and Caicos Islands	34	-	-	-	-	-
United States Virgin Islands	10	-	-	-	-	-
Total Caribbean	**5 974**					
Belize	1 653	612	1 041	-	-	-
Costa Rica	2 391	180	1 319	888	1	3
El Salvador	298	6	286	-	6	-
Guatemala	3 938	1 957	1 859	-	122	-
Honduras	4 648	1 512	2 261	845	-	30
Nicaragua	5 189	1 849	3 289	-	51	-
Panama	4 294	3 023	1 210	0	60	1
Total Central America	**22 411**					
Canada	310 134	165 424	144 710	-	-	-
Greenland	n.s.	-	-	-	-	-
Mexico	64 238	32 850	30 330	-	72	986
Saint Pierre and Miquelon	3	-	3	-	-	-
United States of America	303 089	104 182	175 523	6 323	17 061	-
Total North America	**677 464**					
Total North and Central America	**705 849**					
American Samoa	18	-	-	-	-	-
Australia	163 678	5 233	156 679	-	1 766	-
Cook Islands	16	-	14	-	-	1
Fiji	1 000	894	5	-	101	-
French Polynesia	105	-	95	-	10	-
Guam	26	-	-	-	-	-
Kiribati	2	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-
Micronesia (Federated States of)	63	-	-	-	-	-
Nauru	0	-	-	-	-	-
New Caledonia	717	431	277	-	10	-
New Zealand	8 309	3 506	2 951	-	1 832	20
Niue	14	-	14	-	n.s.	-
Northern Mariana Islands	33	-	-	-	-	-
Palau	40	-	-	-	-	-
Papua New Guinea	29 437	25 211	4 134	-	92	-
Pitcairn	4	-	-	-	-	-
Samoa	171	n.s.	110	29	21	11
Solomon Islands	2 172	-	-	-	-	-
Tokelau	0	-	-	-	-	-
Tonga	4	-	4	-	n.s.	-
Tuvalu	1	-	-	-	-	-
Vanuatu	440	-	-	-	-	-
Wallis and Futuna Islands	5	n.s.	4	0	1	0
Total Oceania	**206 254**					

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Total area	Other wooded land					Country/area
	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	
2	-	2	-	-	-	Saint Vincent and the Grenadines
74	-	74	-	-	-	Trinidad and Tobago
-	-	-	-	-	-	Turks and Caicos Islands
-	-	-	-	-	-	United States Virgin Islands
1 310						**Total Caribbean**
115	0	115	-	-	-	Belize
10	-	10	-	-	-	Costa Rica
201	-	201	-	-	-	El Salvador
1 672	-	-	-	-	-	Guatemala
710	-	710	-	-	-	Honduras
1 022	-	1 022	-	-	-	Nicaragua
1 288	0	1 288	0	0	0	Panama
5 018						**Total Central America**
91 951	69 855	22 096	-	-	-	Canada
8	-	-	-	-	-	Greenland
19 908	17 482	2 426	-	-	-	Mexico
-	-	-	-	-	-	Saint Pierre and Miquelon
-	-	-	-	-	-	United States of America
111 866						**Total North America**
118 194						**Total North and Central America**
-	-	-	-	-	-	American Samoa
421 590	-	-	-	-	-	Australia
-	-	-	-	-	-	Cook Islands
-	-	-	-	-	-	Fiji
-	-	-	-	-	-	French Polynesia
0	-	-	-	-	-	Guam
-	-	-	-	-	-	Kiribati
-	-	-	-	-	-	Marshall Islands
-	-	-	-	-	-	Micronesia (Federated States of)
0	-	-	-	-	-	Nauru
787	412	375	-	-	-	New Caledonia
2 557	411	2 146	-	-	-	New Zealand
-	-	-	-	-	-	Niue
-	-	-	-	-	-	Northern Mariana Islands
-	-	-	-	-	-	Palau
4 474	-	-	-	-	-	Papua New Guinea
0	-	-	-	-	-	Pitcairn
22	-	11	4	4	2	Samoa
-	-	-	-	-	-	Solomon Islands
0	-	-	-	-	-	Tokelau
1	-	1	-	-	-	Tonga
0	-	-	-	-	-	Tuvalu
476	-	-	-	-	-	Vanuatu
1	0	1	0	0	0	Wallis and Futuna Islands
429 908						**Total Oceania**

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Country/area	Forest					
	Total area	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation
Argentina	33 021	-	31 792	-	1 229	-
Bolivia	58 740	29 360	29 360	-	20	-
Brazil	477 698	415 890	56 424	-	5 384	-
Chile	16 121	4 142	9 292	26	2 661	0
Colombia	60 728	53 062	7 337	-	312	16
Ecuador	10 853	4 794	5 895	-	164	-
Falkland Islands	0	-	-	-	-	-
French Guiana	8 063	7 701	361	0	1	0
Guyana	15 104	9 314	5 789	-	-	-
Paraguay	18 475	1 850	16 582	-	43	-
Peru	68 742	61 065	6 923	0	754	-
South Georgia and the South Sandwich Islands	0	-	-	-	-	-
Suriname	14 776	14 214	550	5	7	0
Uruguay	1 506	296	444	-	751	15
Venezuela (Bolivarian Republic of)	47 713	-	-	-	-	-
Total South America	**831 540**					
WORLD	**3 952 025**					

TABLE 8
Characteristics of forest and other wooded land 2005 *(1 000 ha)*

Total area	Other wooded land					Country/area
	Primary	Modified natural	Semi-natural	Productive plantation	Protective plantation	
60 961	-	-	-	-	-	Argentina
2 473	-	-	-	-	-	Bolivia
-	-	-	-	-	-	Brazil
13 241	0	13 185	0	56	0	Chile
18 202	18 039	163	-	-	-	Colombia
1 448	-	1 448	-	-	-	Ecuador
0	-	-	-	-	-	Falkland Islands
0	0	0	0	0	0	French Guiana
3 580	-	3 580	-	-	-	Guyana
-	-	-	-	-	-	Paraguay
22 132	2 213	19 919	-	0	-	Peru
0	-	-	-	-	-	South Georgia and the South Sandwich Islands
-	-	-	-	-	-	Suriname
4	-	4	-	-	-	Uruguay
7 369	-	-	-	-	-	Venezuela (Bolivarian Republic of)
129 410						**Total South America**
1 375 829						**WORLD**

TABLE 9

Change in extent of primary forest 1990–2005

Country/area	Area of primary forest (1 000 ha)			% of total forest area			Annual change rate (ha/year)	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Angola	0	0	0	0	0	0	0	0
Botswana	-	-	-	-	-	-	-	-
British Indian Ocean Territory	-	-	-	-	-	-	-	-
Comoros	0	0	0	0	0	0	0	0
Kenya	742	716	704	20.0	20.0	20.0	-2 520	-2 400
Lesotho	1	1	1	12.0	8.6	7.5	0	0
Madagascar	10 503	10 381	10 347	76.7	79.7	80.6	-12 200	-6 800
Malawi	1 727	1 330	1 132	44.3	37.3	33.3	-39 700	-39 600
Mauritius	0	0	0	0	0	0	0	0
Mayotte	-	-	-	-	-	-	-	-
Mozambique	-	-	-	-	-	-	-	-
Namibia	-	-	-	-	-	-	-	-
Réunion	55	55	55	63.0	63.0	65.0	-30	-20
Seychelles	2	2	2	5.0	5.0	5.0	0	0
South Africa	-	-	-	-	-	-	-	-
Swaziland	-	-	-	-	-	-	-	-
Uganda	-	-	-	-	-	-	-	-
United Republic of Tanzania	-	-	-	-	-	-	-	-
Zambia	-	-	-	-	-	-	-	-
Zimbabwe	-	-	-	-	-	-	-	-
Total Eastern and Southern Africa								
Algeria	-	-	-	-	-	-	-	-
Burkina Faso	0	0	0	0	0	0	0	0
Chad	209	196	190	1.6	1.6	1.6	-1 300	-1 200
Djibouti	-	-	-	-	-	-	-	-
Egypt	-	-	-	-	-	-	-	-
Eritrea	-	-	-	-	-	-	-	-
Ethiopia	-	-	-	-	-	-	-	-
Libyan Arab Jamahiriya	-	-	-	-	-	-	-	-
Mali	-	-	-	-	-	-	-	-
Mauritania	-	-	-	-	-	-	-	-
Morocco	-	-	-	-	-	-	-	-
Niger	220	220	220	11.3	16.6	17.4	0	0
Somalia	-	-	-	-	-	-	-	-
Sudan	15 276	14 098	13 509	20.0	20.0	20.0	-117 807	-117 807
Tunisia	-	-	-	-	-	-	-	-
Western Sahara	-	-	-	-	-	-	-	-
Total Northern Africa								
Benin	-	-	-	-	-	-	-	-
Burundi	-	0	0	-	0	0	-	0
Cameroon	-	-	-	-	-	-	-	-
Cape Verde	-	-	-	-	-	-	-	-
Central African Republic	-	-	-	-	-	-	-	-
Congo	7 548	7 492	7 464	33.2	33.2	33.2	-5 647	-5 647
Côte d'Ivoire	625	625	625	6.1	6.1	6.0	0	0
Democratic Republic of the Congo	-	-	-	-	-	-	-	-

TABLE 9
Change in extent of primary forest 1990–2005

Country/area	Area of primary forest *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Equatorial Guinea	-	-	-	-	-	-	-	-
Gabon	-	-	-	-	-	-	-	-
Gambia	-	-	-	-	-	-	-	-
Ghana	353	353	353	4.7	5.8	6.4	0	0
Guinea	63	63	63	0.9	0.9	0.9	0	0
Guinea-Bissau	940	940	940	42.4	44.3	45.4	0	0
Liberia	129	129	129	3.2	3.7	4.1	0	0
Nigeria	1 556	736	326	9.0	5.6	2.9	-82 000	-82 000
Rwanda	0	0	0	0	0	0	0	0
Saint Helena	-	-	-	-	-	-	-	-
Sao Tome and Principe	12	12	12	43.8	43.8	43.8	0	0
Senegal	1 759	1 653	1 598	18.8	18.6	18.4	-10 600	-11 000
Sierra Leone	-	-	-	-	-	-	-	-
Togo	0	0	0	0	0	0	0	0
Total Western and Central Africa								
Total Africa								
China	11 632	11 632	11 632	7.4	6.6	5.9	0	0
Democratic People's Republic of Korea	1 129	939	852	13.8	13.8	13.8	-19 000	-17 400
Japan	3 764	4 054	4 591	15.1	16.3	18.5	29 000	107 400
Mongolia	5 540	4 923	4 733	48.2	46.2	46.2	-61 700	-38 000
Republic of Korea	-	-	-	-	-	-	-	-
Total East Asia								
Bangladesh	-	-	-	-	-	-	-	-
Bhutan	413	413	413	13.6	13.1	12.9	0	0
Brunei Darussalam	313	288	278	100	100	100	-2 500	-2 000
Cambodia	766	456	322	5.9	4.0	3.1	-31 000	-26 800
India	-	-	-	-	-	-	-	-
Indonesia	70 419	55 941	48 702	60.4	57.2	55	-1 447 800	-1 447 800
Lao People's Democratic Republic	1 490	1 490	1 490	8.6	9.0	9.2	0	0
Malaysia	3 820	3 820	3 820	17.1	17.7	18.3	0	0
Maldives	-	-	-	-	-	-	-	-
Myanmar	-	-	-	-	-	-	-	-
Nepal	391	384	349	8.1	9.8	9.6	-700	-7 000
Pakistan	-	-	-	-	-	-	-	-
Philippines	829	829	829	7.8	10.4	11.6	0	0
Singapore	2	2	2	100	100	100	0	0
Sri Lanka	257	197	167	10.9	9.5	8.6	-6 000	-6 000
Thailand	6 451	6 451	6 451	40.4	43.5	44.4	0	0
Timor-Leste	-	-	-	-	-	-	-	-
Viet Nam	384	187	85	4.1	1.6	0.7	-19 700	-20 400
Total South and Southeast Asia								
Afghanistan	-	-	-	-	-	-	-	-
Armenia	17	15	14	4.9	4.9	4.9	-200	-200
Azerbaijan	400	400	400	42.7	42.7	42.7	0	0

TABLE 9
Change in extent of primary forest 1990–2005

Country/area	Area of primary forest (1 000 ha)			% of total forest area			Annual change rate (ha/year)	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Bahrain	-	-	-	-	-	-	-	-
Cyprus	22	22	22	13.7	12.7	12.6	0	0
Georgia	500	500	500	18.1	18.1	18.1	0	0
Iran (Islamic Republic of)	200	200	200	1.8	1.8	1.8	0	0
Iraq	0	0	0	0	0	0	0	0
Israel	-	-	-	-	-	-	-	-
Jordan	0	0	0	0	0	0	0	0
Kazakhstan	0	0	0	0	0	0	0	0
Kuwait	-	-	-	-	-	-	-	-
Kyrgyzstan	237	240	241	28.4	27.9	27.7	250	260
Lebanon	-	-	0	-	-	0	-	-
Occupied Palestinian Territory	-	-	-	-	-	-	-	-
Oman	-	-	-	-	-	-	-	-
Qatar	-	-	-	-	-	-	-	-
Saudi Arabia	-	-	-	-	-	-	-	-
Syrian Arab Republic	-	-	-	-	-	-	-	-
Tajikistan	297	297	297	72.8	72.4	72.4	0	0
Turkey	739	897	975	7.6	8.9	9.6	15 800	15 600
Turkmenistan	104	104	104	2.5	2.5	2.5	0	0
United Arab Emirates	0	0	0	0	0	0	0	0
Uzbekistan	57	57	57	1.9	1.8	1.7	0	0
Yemen	-	-	-	-	-	-	-	-
Total Western and Central Asia								
Total Asia								
Albania	85	85	85	10.7	11.0	10.7	0	0
Andorra	-	-	-	-	-	-	-	-
Austria	117	119	-	3.1	3.1	-	200	-
Belarus	400	400	400	5.4	5.1	5.1	0	0
Belgium	0	0	0	0	0	0	0	0
Bosnia and Herzegovina	-	2	2	-	0.1	0.1	-	0
Bulgaria	267	396	-	8.0	11.7	-	12 900	-
Channel Islands	-	-	-	-	-	-	-	-
Croatia	10	10	10	0.5	0.5	0.5	0	0
Czech Republic	0	0	0	0	0	0	0	0
Denmark	0	0	0	0	0	0	0	0
Estonia	-	137	142	-	6.1	6.2	-	1 000
Faeroe Islands	-	-	-	-	-	-	-	-
Finland	1 491	1 418	1 419	6.7	6.3	6.3	-7 300	200
France	30	30	30	0.2	0.2	0.2	0	0
Germany	0	0	0	0	0	0	0	0
Gibraltar	-	-	-	-	-	-	-	-
Greece	0	0	0	0	0	0	0	0
Holy See	-	-	-	-	-	-	-	-
Hungary	0	0	0	0	0	0	0	0
Iceland	0	0	0	0	0	0	0	0
Ireland	1	0	0	0.2	0	0	-100	0
Isle of Man	-	-	-	-	-	-	-	-

TABLE 9
Change in extent of primary forest 1990–2005

Country/area	Area of primary forest *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Italy	160	160	-	1.9	1.7	-	0	-
Latvia	-	15	14	-	0.5	0.5	-	-280
Liechtenstein	2	2	2	23.1	21.7	21.7	0	0
Lithuania	20	21	26	1.0	1.0	1.2	100	1 000
Luxembourg	-	-	-	-	-	-	-	-
Malta	0	0	0	0	0	0	0	0
Monaco	-	-	-	-	-	-	-	-
Netherlands	0	0	0	0	0	0	0	0
Norway	250	250	250	2.7	2.7	2.7	0	0
Poland	30	51	53	0.3	0.6	0.6	2 100	400
Portugal	55	55	55	1.8	1.5	1.5	0	0
Republic of Moldova	0	0	0	0	0	0	0	0
Romania	233	233	233	3.7	3.7	3.7	0	0
Russian Federation	241 726	258 131	255 470	29.9	31.9	31.6	1 640 510	-532 200
San Marino	-	-	-	-	-	-	-	-
Serbia and Montenegro	4	4	4	0.2	0.2	0.1	0	0
Slovakia	24	24	24	1.2	1.2	1.2	0	0
Slovenia	63	95	119	5.3	7.7	9.4	3 200	4 800
Spain	621	748	812	4.6	4.6	4.5	12 700	12 800
Sweden	4 348	4 600	4 726	15.9	16.7	17.2	25 200	25 200
Switzerland	3	6	14	0.3	0.5	1.1	300	1 600
The former Yugoslav Republic of Macedonia	0	0	0	0	0	0	0	0
Ukraine	59	59	59	0.6	0.6	0.6	0	0
United Kingdom	0	0	0	0	0	0	0	0
Total Europe								
Anguilla	-	-	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-	-	-	-
Aruba	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	-	-	-	-	-	-	-	-
Bermuda	-	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-	-	-
Cuba	-	-	-	-	-	-	-	-
Dominica	28	28	27	56.8	58.2	59.0	-86	-84
Dominican Republic	-	-	-	-	-	-	-	-
Grenada	1	1	1	24.1	18.7	16.0	-22	-23
Guadeloupe	19	19	19	22.3	23.0	23.3	0	0
Haiti	-	-	-	-	-	-	-	-
Jamaica	-	-	-	-	-	-	-	-
Martinique	-	-	-	-	-	-	-	-
Montserrat	-	-	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-	-	-
Puerto Rico	-	-	-	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-	-	-	-
Saint Lucia	-	-	-	-	-	-	-	-

TABLE 9
Change in extent of primary forest 1990–2005

Country/area	Area of primary forest (1 000 ha)			% of total forest area			Annual change rate (ha/year)	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Saint Vincent and the Grenadines	-	-	-	-	-	-	-	-
Trinidad and Tobago	14	14	14	6.0	6.1	6.2	0	0
Turks and Caicos Islands	-	-	-	-	-	-	-	-
United States Virgin Islands	-	-	-	-	-	-	-	-
Total Caribbean								
Belize	612	612	612	37.0	37.0	37.0	0	0
Costa Rica	255	180	180	9.9	7.6	7.5	-7 500	0
El Salvador	6	6	6	1.7	2.0	2.2	0	0
Guatemala	2 359	2 091	1 957	49.7	49.7	49.7	-26 789	-26 834
Honduras	1 512	1 512	1 512	20.5	27.8	32.5	0	0
Nicaragua	1 849	1 849	1 849	28.3	33.4	35.6	0	0
Panama	3 706	3 239	3 023	84.7	75.2	70.4	-46 700	-43 200
Total Central America								
Canada	165 424	165 424	165 424	53.3	53.3	53.3	0	0
Greenland	-	-	-	-	-	-	-	-
Mexico	38 775	34 825	32 850	56.2	53.1	51.1	-395 000	-395 000
Saint Pierre and Miquelon	-	-	-	-	-	-	-	-
United States of America	105 268	105 258	104 182	35.2	34.8	34.4	-1 000	-215 200
Total North America								
Total North and Central America								
American Samoa	-	-	-	-	-	-	-	-
Australia	-	5 233	5 233	-	3.2	3.2	-	0
Cook Islands	-	-	-	-	-	-	-	-
Fiji	895	894	894	91.4	89.4	89.4	-100	0
French Polynesia	-	-	-	-	-	-	-	-
Guam	-	-	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-	-	-	-
Nauru	-	-	-	-	-	-	-	-
New Caledonia	431	431	431	60.1	60.1	60.1	0	0
New Zealand	3 506	3 506	3 506	45.4	42.6	42.2	0	0
Niue	-	-	-	-	-	-	-	-
Northern Mariana Islands	-	-	-	-	-	-	-	-
Palau	-	-	-	-	-	-	-	-
Papua New Guinea	29 210	26 462	25 211	92.7	87.8	85.6	-274 800	-250 200
Pitcairn	-	-	-	-	-	-	-	-
Samoa	-	n.s.	n.s.	-	n.s.	n.s.	-	0
Solomon Islands	-	-	-	-	-	-	-	-
Tokelau	-	-	-	-	-	-	-	-
Tonga	-	-	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-	-
Wallis and Futuna Islands	0	n.s.	n.s.	8.5	8.8	9.1	-2	-6
Total Oceania								

TABLE 9
Change in extent of primary forest 1990–2005

Country/area	Area of primary forest *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Argentina	-	-	-	-	-	-	-	-
Bolivia	31 388	30 036	29 360	50.0	50.0	50.0	-135 200	-135 200
Brazil	460 513	433 220	415 890	88.6	87.8	87.1	-2 729 300	-3 466 000
Chile	4 152	4 145	4 142	27.2	26.2	25.7	-700	-600
Colombia	53 854	53 343	53 062	87.7	87.5	87.4	-51 050	-56 160
Ecuador	4 794	4 794	4 794	34.7	40.5	44.2	20	-40
Falkland Islands	-	-	-	-	-	-	-	-
French Guiana	7 909	7 761	7 701	97.8	96.3	95.5	-14 800	-12 000
Guyana	-	9 314	9 314	-	61.7	61.7	-	0
Paraguay	1 850	1 850	1 850	8.7	9.6	10.0	0	0
Peru	62 910	62 188	61 065	89.7	89.9	88.8	-72 200	-224 600
South Georgia and the South Sandwich Islands	-	-	-	-	-	-	-	-
Suriname	14 214	14 214	14 214	96.2	96.2	96.2	0	0
Uruguay	239	296	296	26.4	21.0	19.7	5 700	0
Venezuela (Bolivarian Republic of)	-	-	-	-	-	-	-	-
Total South America								
WORLD								

TABLE 10

Change in extent of forest plantations[a] 1990–2005

Country/area	Area of forest plantations (1 000 ha)			% of total forest area			Annual change rate (ha/year)	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Angola	140	134	131	0.2	0.2	0.2	-562	-564
Botswana	-	-	-	-	-	-	-	-
British Indian Ocean Territory	-	-	-	-	-	-	-	-
Comoros	2	2	1	16.7	25.0	26.6	0	-110
Kenya	238	212	202	6.4	5.9	5.7	-2 600	-2 000
Lesotho	4	6	7	88.0	91.4	92.5	200	200
Madagascar	293	293	293	2.1	2.2	2.3	0	0
Malawi	132	180	204	3.4	5.0	6.0	4 800	4 800
Mauritius	16	15	15	41	39.5	40.5	-100	0
Mayotte	n.s.	n.s.	n.s.	4.8	5.0	5.1	0	0
Mozambique	38	38	38	0.2	0.2	0.2	0	0
Namibia	-	-	-	-	-	-	-	-
Réunion	5	5	5	6.0	6.0	6.0	0	-40
Seychelles	5	5	5	12.5	12.5	12.5	0	0
South Africa	1 204	1 352	1 426	13.1	14.7	15.5	14 800	14 800
Swaziland	135	121	114	28.6	23.4	21.1	-1 400	-1 400
Uganda	33	35	36	0.7	0.9	1.0	200	200
United Republic of Tanzania	150	150	150	0.4	0.4	0.4	0	0
Zambia	60	75	75	0.1	0.2	0.2	1 500	0
Zimbabwe	154	154	154	0.7	0.8	0.9	0	0
Total Eastern and Southern Africa								
Algeria	620	652	754	34.6	30.4	33.1	3 200	20 400
Burkina Faso	33	63	76	0.5	0.9	1.1	3 000	2 600
Chad	11	14	15	0.1	0.1	0.1	300	300
Djibouti	-	-	-	-	-	-	-	-
Egypt	44	59	67	100	100	100	1 500	1 600
Eritrea	10	22	28	0.6	1.4	1.8	1 200	1 160
Ethiopia	491	491	491	3.2	3.6	3.8	0	0
Libyan Arab Jamahiriya	217	217	217	100	100	100	0	0
Mali	-	60	-	-	0.5	-	-	-
Mauritania	-	10	-	-	3.2	-	-	-
Morocco	478	523	563	11.1	12.1	12.9	4 500	8 000
Niger	-	72	110	-	5.5	8.7	-	7 500
Somalia	3	3	3	n.s.	n.s.	n.s.	0	0
Sudan	6 111	5 639	5 404	8.0	8.0	8.0	-47 123	-47 123
Tunisia	226	423	498	35.1	44.1	47.2	19 700	15 000
Western Sahara	-	-	-	-	-	-	-	-
Total Northern Africa								
Benin	98	109	114	3.0	4.1	4.8	1 100	1 000
Burundi	-	86	86	-	43.2	56.2	-	0
Cameroon	-	-	-	-	-	-	-	-
Cape Verde	58	82	84	100	100	100	2 435	300
Central African Republic	2	4	5	n.s.	n.s.	n.s.	230	200
Congo	51	51	51	0.2	0.2	0.2	0	0
Côte d'Ivoire	154	261	337	1.5	2.5	3.2	10 700	15 200
Democratic Republic of the Congo	-	-	-	-	-	-	-	-

TABLE 10
Change in extent of forest plantations[a] 1990–2005

Country/area	Area of forest plantations *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Equatorial Guinea	-	-	-	-	-	-	-	-
Gabon	36	36	36	0.2	0.2	0.2	0	0
Gambia	n.s.	n.s.	n.s.	0.1	0.1	0.1	0	0
Ghana	50	60	160	0.7	1.0	2.9	1 000	20 000
Guinea	17	22	33	0.2	0.3	0.5	546	2 040
Guinea-Bissau	n.s.	n.s.	1	n.s.	n.s.	n.s.	15	34
Liberia	8	8	8	0.2	0.2	0.3	0	0
Nigeria	251	316	349	1.5	2.4	3.1	6 500	6 600
Rwanda	248	282	419	78.0	82.1	87.2	3 450	27 220
Saint Helena	-	-	-	-	-	-	-	-
Sao Tome and Principe	-	-	-	-	-	-	-	-
Senegal	205	306	365	2.2	3.4	4.2	10 100	11 800
Sierra Leone	2	3	3	0.1	0.1	0.1	60	80
Togo	24	34	38	3.5	7.0	9.8	1 000	800
Total Western and Central Africa								
Total Africa								
China	18 466	23 924	31 369	11.8	13.5	15.9	545 800	1 489 000
Democratic People's Republic of Korea	-	-	-	-	-	-	-	-
Japan	10 287	10 331	10 321	41.2	41.5	41.5	4 400	-2 000
Mongolia	30	75	112	0.3	0.7	1.1	4 500	7 400
Republic of Korea	748	1 188	1 364	11.7	18.9	21.8	44 000	35 200
Total East Asia								
Bangladesh	239	276	279	27.1	31.2	32.0	3 700	600
Bhutan	1	1	2	n.s.	n.s.	0.1	0	200
Brunei Darussalam	-	-	-	-	-	-	-	-
Cambodia	67	72	59	0.5	0.6	0.6	500	-2 600
India	1 954	2 805	3 226	3.1	4.2	4.8	85 100	84 200
Indonesia	2 209	3 002	3 399	1.9	3.1	3.8	79 300	79 400
Lao People's Democratic Republic	4	99	224	n.s.	0.6	1.4	9 500	25 000
Malaysia	1 956	1 659	1 573	8.7	7.7	7.5	-29 700	-17 200
Maldives	-	-	-	-	-	-	-	-
Myanmar	394	696	849	1.0	2.0	2.6	30 200	30 600
Nepal	49	52	53	1.0	1.3	1.5	300	200
Pakistan	234	296	318	9.3	14.0	16.7	6 200	4 400
Philippines	1 780	852	620	16.8	10.7	8.7	-92 800	-46 400
Singapore	0	0	0	0	0	0	0	0
Sri Lanka	242	221	195	10.3	10.6	10.1	-2 120	-5 141
Thailand	2 640	3 077	3 099	16.5	20.8	21.3	43 700	4 400
Timor-Leste	29	43	43	3.0	5.0	5.4	1 400	0
Viet Nam	967	2 050	2 695	10.3	17.5	20.8	108 300	129 000
Total South and Southeast Asia								
Afghanistan	-	-	-	-	-	-	-	-
Armenia	14	11	10	4.0	3.6	3.5	-300	-200
Azerbaijan	20	20	20	2.1	2.1	2.1	0	0

TABLE 10
Change in extent of forest plantations[a] 1990–2005

Country/area	Area of forest plantations *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Bahrain	n.s.	n.s.	n.s.	100	100	100	16	15
Cyprus	3	3	5	1.9	1.7	2.9	0	400
Georgia	54	60	60	2.0	2.2	2.2	600	100
Iran (Islamic Republic of)	616	616	616	5.6	5.6	5.6	0	0
Iraq	15	15	13	1.9	1.8	1.6	0	-400
Israel	84	94	101	54.5	57.3	59.1	1 000	1 400
Jordan	40	40	40	47.6	47.6	47.6	0	0
Kazakhstan	1 034	1 056	909	30.2	31.4	27.2	2 200	-29 400
Kuwait	3	5	6	100	100	100	140	140
Kyrgyzstan	46	59	66	5.4	6.9	7.6	1 380	1 380
Lebanon	-	-	8	-	-	5.7	-	-
Occupied Palestinian Territory	-	-	-	-	-	-	-	-
Oman	2	2	2	100	100	100	0	0
Qatar	-	-	-	-	-	-	-	-
Saudi Arabia	-	-	-	-	-	-	-	-
Syrian Arab Republic	175	234	264	47.0	54.2	57.3	5 950	5 960
Tajikistan	76	66	66	18.6	16.1	16.1	-1 000	0
Turkey	1 839	2 304	2 537	19.0	22.9	24.9	46 500	46 600
Turkmenistan	0	0	0	0	0	0	0	0
United Arab Emirates	245	310	312	100	100	100	6 500	400
Uzbekistan	30	51	61	1.0	1.6	1.9	2 100	2 000
Yemen	-	-	-	-	-	-	-	-
Total Western and Central Asia								
Total Asia								
Albania	103	96	88	13.1	12.5	11.1	-690	-1 640
Andorra	-	-	-	-	-	-	-	-
Austria	988	1 003	-	26.2	26.1	-	1 500	-
Belarus	2	2	2	n.s.	n.s.	n.s.	30	0
Belgium	303	284	275	44.8	42.5	41.2	-1 970	-1 700
Bosnia and Herzegovina	-	142	142	-	6.5	6.5	-	0
Bulgaria	40	48	-	1.2	1.4	-	720	-
Channel Islands	-	-	-	-	-	-	-	-
Croatia	56	60	61	2.6	2.8	2.9	400	200
Czech Republic	0	0	0	0	0	0	0	0
Denmark	291	305	315	65.4	62.8	63.0	1 400	2 000
Estonia	-	1	1	-	n.s.	n.s.	-	0
Faeroe Islands	-	-	-	-	-	-	-	-
Finland	0	0	0	0	0	0	0	0
France	1 842	1 936	1 968	12.7	12.6	12.7	9 400	6 400
Germany	0	0	0	0	0	0	0	0
Gibraltar	-	-	-	-	-	-	-	-
Greece	118	129	134	3.6	3.6	3.6	1 100	1 000
Holy See	-	-	-	-	-	-	-	-
Hungary	431	528	545	23.9	27.7	27.6	9 670	3 480
Iceland	8	21	29	30.4	56.1	62.2	1 370	1 460
Ireland	350	519	579	79.4	85.2	86.5	16 900	12 000
Isle of Man	-	-	-	-	-	-	-	-

TABLE 10
Change in extent of forest plantations[a] 1990–2005

Country/area	Area of forest plantations *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Italy	289	144	146	3.4	1.5	1.5	-14 500	400
Latvia	-	n.s.	1	-	n.s.	n.s.	-	238
Liechtenstein	n.s.	n.s.	n.s.	3.1	4.3	4.3	10	0
Lithuania	124	137	141	6.4	6.8	6.7	1 300	800
Luxembourg	28	28	28	33.0	32.6	32.6	0	0
Malta	n.s.	n.s.	n.s.	100	100	100	0	0
Monaco	-	-	-	-	-	-	-	-
Netherlands	4	4	4	1.2	1.1	1.1	0	0
Norway	222	255	262	2.4	2.7	2.8	3 300	1 400
Poland	32	32	32	0.4	0.4	0.3	0	0
Portugal	550	1 034	1 234	17.7	28.9	32.6	48 400	40 000
Republic of Moldova	1	1	1	0.3	0.3	0.3	0	0
Romania	149	149	149	2.3	2.3	2.3	0	0
Russian Federation	12 651	15 360	16 962	1.6	1.9	2.1	270 920	320 420
San Marino	-	-	-	-	-	-	-	-
Serbia and Montenegro	39	39	39	1.5	1.5	1.4	0	0
Slovakia	23	20	19	1.2	1.0	1.0	-300	-200
Slovenia	0	0	0	0	0	0	0	0
Spain	1 126	1 356	1 471	8.4	8.3	8.2	23 000	23 000
Sweden	523	619	667	1.9	2.3	2.4	9 600	9 600
Switzerland	3	4	4	0.3	0.3	0.3	100	0
The former Yugoslav Republic of Macedonia	30	30	30	3.3	3.3	3.3	0	0
Ukraine	325	367	388	3.5	3.9	4.1	4 200	4 200
United Kingdom	1 877	1 934	1 924	71.9	69.2	67.6	5 700	-2 000
Total Europe								
Anguilla	-	-	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-	-	-	-
Aruba	-	-	-	-	-	-	-	-
Bahamas	0	0	0	0	0	0	0	0
Barbados	-	-	-	-	-	-	-	-
Bermuda	-	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-	-	-
Cuba	347	342	394	16.9	14.0	14.5	-500	10 400
Dominica	-	n.s.	n.s.	-	0.2	0.2	-	0
Dominican Republic	-	-	-	-	-	-	-	-
Grenada	n.s.	n.s.	n.s.	5.2	5.2	5.2	0	0
Guadeloupe	3	1	1	3.6	1.2	1.3	-200	0
Haiti	12	20	24	10.3	18.3	22.9	800	800
Jamaica	15	14	14	4.3	4.2	4.3	-40	20
Martinique	1	1	1	3.2	3.2	3.2	0	0
Montserrat	-	-	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-	-	-
Puerto Rico	-	-	-	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-	-	-	-
Saint Lucia	-	-	-	-	-	-	-	-

TABLE 10
Change in extent of forest plantations[a] 1990–2005

Country/area	Area of forest plantations *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Saint Vincent and the Grenadines	n.s.	n.s.	n.s.	1.3	2.4	3.0	13	14
Trinidad and Tobago	15	15	15	6.4	6.6	6.6	0	0
Turks and Caicos Islands	-	-	-	-	-	-	-	-
United States Virgin Islands	-	-	-	-	-	-	-	-
Total Caribbean								
Belize	-	-	-	-	-	-	-	-
Costa Rica	-	3	4	-	0.1	0.2	-	200
El Salvador	6	6	6	1.6	1.9	2.0	0	0
Guatemala	32	88	122	0.7	2.1	3.1	5 600	6 800
Honduras	31	26	30	0.4	0.5	0.6	-500	800
Nicaragua	4	46	51	0.1	0.8	1.0	4 200	1 000
Panama	10	42	61	0.2	1.0	1.4	3 200	3 800
Total Central America								
Canada	-	-	-	-	-	-	-	-
Greenland	-	-	-	-	-	-	-	-
Mexico	-	1 058	1 058	-	1.6	1.6	-	0
Saint Pierre and Miquelon	-	-	-	-	-	-	-	-
United States of America	10 305	16 274	17 061	3.5	5.4	5.6	596 900	157 400
Total North America								
Total North and Central America								
American Samoa	-	-	-	-	-	-	-	-
Australia	1 023	1 485	1 766	0.6	0.9	1.1	46 200	56 200
Cook Islands	0	1	1	3.4	7.1	7.1	60	0
Fiji	80	101	101	8.2	10.1	10.1	2 100	0
French Polynesia	10	10	10	9.5	9.5	9.5	0	0
Guam	-	-	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-	-	-	-
Nauru	-	-	-	-	-	-	-	-
New Caledonia	10	10	10	1.4	1.4	1.4	0	0
New Zealand	1 261	1 769	1 852	16.3	21.5	22.3	50 800	16 600
Niue	n.s.	n.s.	n.s.	0.1	1.9	2.1	28	0
Northern Mariana Islands	-	-	-	-	-	-	-	-
Palau	-	-	-	-	-	-	-	-
Papua New Guinea	63	82	92	0.2	0.3	0.3	1 960	1 980
Pitcairn	-	-	-	-	-	-	-	-
Samoa	-	32	32	-	18.7	18.7	-	0
Solomon Islands	-	-	-	-	-	-	-	-
Tokelau	-	-	-	-	-	-	-	-
Tonga	n.s.	n.s.	n.s.	0.6	0.6	0.6	0	0
Tuvalu	-	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-	-
Wallis and Futuna Islands	n.s.	0	1	3.4	9.2	10.8	30	6
Total Oceania								

TABLE 10
Change in extent of forest plantations[a] 1990–2005

Country/area	Area of forest plantations *(1 000 ha)*			% of total forest area			Annual change rate *(ha/year)*	
	1990	2000	2005	1990	2000	2005	1990–2000	2000–2005
Argentina	769	1 078	1 229	2.2	3.2	3.7	30 900	30 200
Bolivia	20	20	20	n.s.	n.s.	n.s.	0	0
Brazil	5 070	5 279	5 384	1.0	1.1	1.1	20 900	21 000
Chile	1 741	2 354	2 661	11.4	14.9	16.5	61 300	61 400
Colombia	136	254	328	0.2	0.4	0.5	11 750	14 880
Ecuador	-	162	164	-	1.4	1.5	-	560
Falkland Islands	-	-	-	-	-	-	-	-
French Guiana	1	1	1	n.s.	n.s.	n.s.	0	0
Guyana	-	-	-	-	-	-	-	-
Paraguay	23	36	43	0.1	0.2	0.2	1 300	1 400
Peru	263	715	754	0.4	1.0	1.1	45 200	7 800
South Georgia and the South Sandwich Islands	-	-	-	-	-	-	-	-
Suriname	7	7	7	n.s.	n.s.	n.s.	0	0
Uruguay	201	669	766	22.2	47.5	50.9	46 800	19 400
Venezuela (Bolivarian Republic of)	-	-	-	-	-	-	-	-
Total South America								
WORLD								

[a] Productive and protective forest plantations combined.

TABLE 11

Growing stock[a] in forest and other wooded land 2005

Country/area	Forest				Other wooded land	
	Area (1 000 ha)	Growing stock			Area (1 000 ha)	Total growing stock (million m³)
		By area (m³/ha)	Total (million m³)	Commercial (%)		
Angola	59 104	39	2 291	1.1	-	-
Botswana[b]	11 943	16	197	-	34 791	573
British Indian Ocean Territory	3	-	-	-	0	-
Comoros	5	247	1	26.9	-	-
Kenya	3 522	80	281	10.8	34 920	-
Lesotho	8	-	-	-	31	n.s.
Madagascar	12 838	171	2 201	28.3	17 054	-
Malawi	3 402	110	373	-	-	-
Mauritius	37	82	3	68.0	15	n.s.
Mayotte	5	-	-	-	-	-
Mozambique	19 262	26	496	14.4	40 919	745
Namibia	7 661	24	184	-	8 473	44
Réunion	84	-	-	-	55	-
Seychelles	40	75	3	12.0	-	-
South Africa	9 203	69	635	38.1	21 409	428
Swaziland	541	35	19	-	289	3
Uganda	3 627	43	156	15.0	1 150	8
United Republic of Tanzania	35 257	36	1 264	73.3	4 756	48
Zambia	42 452	31	1 307	7.1	3 161	44
Zimbabwe	17 540	34	600	3.8	-	-
Total Eastern and Southern Africa	**226 534**	**44**				
Algeria	2 277	76	174	22.0	1 595	-
Burkina Faso	6 794	35	238	4.6	7 427	10
Chad	11 921	18	218	38.1	9 152	67
Djibouti	6	32	n.s.	-	220	-
Egypt	67	120	8	-	20	n.s.
Eritrea	1 554	-	-	-	7 257	-
Ethiopia	13 000	22	285	25.0	44 650	103
Libyan Arab Jamahiriya	217	36	8	-	330	4
Mali[b]	12 572	15	191	-	16 532	252
Mauritania	267	20	5	-	3 110	-
Morocco	4 364	44	191	100	406	1
Niger	1 266	10	13	8.1	3 740	12
Somalia	7 131	22	157	n.s.	-	-
Sudan	67 546	14	939	-	-	-
Tunisia	1 056	26	27	2.3	170	1
Western Sahara	1 011	38	38	-	-	-
Total Northern Africa	**131 048**	**19**				
Benin	2 351	-	-	-	3 959	-
Burundi	152	-	-	-	722	-
Cameroon	21 245	62	1 313	10.1	14 758	-
Cape Verde	84	144	12	80.0	-	-
Central African Republic	22 755	167	3 801	-	10 122	-
Congo	22 471	203	4 551	30.0	10 547	480
Côte d'Ivoire	10 405	258	2 683	19.9	2 626	-

TABLE 11
Growing stock[a] in forest and other wooded land 2005

Country/area	Forest				Other wooded land	
	Area *(1 000 ha)*	Growing stock			Area *(1 000 ha)*	Total growing stock *(million m³)*
		By area *(m³/ha)*	Total *(million m³)*	Commercial *(%)*		
Democratic Republic of the Congo	133 610	231	30 833	-	83 277	-
Equatorial Guinea	1 632	66	107	-	31	-
Gabon	21 775	223	4 845	-	-	-
Gambia	471	37	18	-	125	2
Ghana	5 517	58	321	53.3	0	-
Guinea	6 724	77	520	-	5 850	-
Guinea-Bissau	2 072	24	50	20.0	236	1
Liberia	3 154	158	498	41.5	0	-
Nigeria	11 089	125	1 386	10.9	5 495	-
Rwanda	480	183	88	95.1	61	2
Saint Helena	2	-	-	-	0	-
Sao Tome and Principe	27	164	4	100	29	-
Senegal	8 673	37	324	63.3	5 001	23
Sierra Leone	2 754	-	-	-	384	-
Togo	386	-	-	-	1 246	-
Total Western and Central Africa	**277 829**	**189**				
Total Africa	**635 412**	**102**				
China	197 290	67	13 255	91.8	87 615	993
Democratic People's Republic of Korea	6 187	64	395	-	-	-
Japan	24 868	171	4 249	-	-	-
Mongolia	10 252	131	1 342	46.1	2 388	2
Republic of Korea	6 265	80	502	53.6	-	-
Total East Asia	**244 862**	**81**				
Bangladesh	871	34	30	75.0	58	-
Bhutan	3 195	194	621	40.1	611	-
Brunei Darussalam	278	219	61	40.0	160	-
Cambodia	10 447	96	998	40.0	270	-
India	67 701	69	4 698	40.0	4 110	-
Indonesia	88 495	59	5 216	-	-	-
Lao People's Democratic Republic	16 142	59	957	74.0	4 643	32
Malaysia	20 890	251	5 242	-	-	-
Maldives	1	-	-	-	0	-
Myanmar	32 222	85	2 740	17.8	10 834	-
Nepal	3 636	178	647	40.0	1 897	67
Pakistan	1 902	97	185	43.2	1 389	-
Philippines	7 162	174	1 248	4.3	3 611	-
Singapore	2	-	-	-	0	-
Sri Lanka	1 933	22	42	40.0	0	-
Thailand	14 520	41	599	59.9	-	-
Timor-Leste	798	-	-	-	-	-
Viet Nam	12 931	66	850	8.5	2 259	-
Total South and Southeast Asia	**283 127**	**85**				
Afghanistan	867	16	14	40.0	-	-

TABLE 11
Growing stock[a] in forest and other wooded land 2005

Country/area	Forest				Other wooded land	
	Area (1 000 ha)	Growing stock			Area (1 000 ha)	Total growing stock (million m³)
		By area (m³/ha)	Total (million m³)	Commercial (%)		
Armenia	283	125	36	-	45	1
Azerbaijan	936	136	127	20.4	54	-
Bahrain	n.s.	-	-	-	0	-
Cyprus	174	46	8	39.0	214	-
Georgia	2 760	167	461	26.2	50	1
Iran (Islamic Republic of)	11 075	48	527	78.9	5 340	-
Iraq	822	-	-	-	927	-
Israel	171	37	6	70.0	85	-
Jordan	83	30	2	-	52	-
Kazakhstan	3 337	109	364	0	15 622	17
Kuwait	6	-	-	-	0	-
Kyrgyzstan	869	34	30	0	313	-
Lebanon	136	36	5	-	106	1
Occupied Palestinian Territory	9	-	-	-	-	-
Oman	2	-	-	-	1 303	-
Qatar	n.s.	-	-	-	n.s.	-
Saudi Arabia	2 728	8	23	0	34 155	171
Syrian Arab Republic	461	-	-	-	35	-
Tajikistan	410	12	5	0	142	0
Turkey	10 175	138	1 400	86.6	10 689	-
Turkmenistan	4 127	4	14	0	0	0
United Arab Emirates	312	49	15	0	4	n.s.
Uzbekistan	3 295	7	24	0.1	904	-
Yemen[b]	549	9	5	-	1 406	12
Total Western and Central Asia	**43 588**	**73**				
Total Asia	**571 577**	**82**				
Albania	794	99	78	81.0	261	11
Andorra	16	-	-	-	-	-
Austria	3 862	300	1 159	97.7	118	-
Belarus	7 894	179	1 411	82.8	914	-
Belgium	667	258	172	100	27	-
Bosnia and Herzegovina	2 185	179	391	80.1	549	-
Bulgaria	3 625	157	568	61.1	27	-
Channel Islands	1	-	-	-	0	-
Croatia	2 135	165	352	83.0	346	-
Czech Republic	2 648	278	736	96.7	0	0
Denmark	500	153	76	76.1	136	-
Estonia	2 284	196	447	93.7	82	4
Faeroe Islands	n.s.	-	-	-	-	-
Finland	22 500	96	2 158	84.1	802	5
France	15 554	158	2 465	93.5	1 708	-
Germany	11 076	-	-	-	-	-
Gibraltar	0	-	-	-	0	-
Greece	3 752	47	177	88.1	2 780	0
Holy See	0	-	-	-	0	-
Hungary	1 976	171	337	97.6	0	0

TABLE 11

Growing stock[a] in forest and other wooded land 2005

Country/area	Forest				Other wooded land	
	Area *(1 000 ha)*	Growing stock			Area *(1 000 ha)*	Total growing stock *(million m³)*
		By area *(m³/ha)*	Total *(million m³)*	Commercial *(%)*		
Iceland	46	65	3	-	104	n.s.
Ireland	669	98	65	-	41	-
Isle of Man	3	-	-	-	0	-
Italy	9 979	145	1 447	70.1	1 047	97
Latvia	2 941	204	599	85.3	115	-
Liechtenstein	7	254	2	80.0	0	-
Lithuania	2 099	190	400	86.0	77	2
Luxembourg	87	299	26	100	1	-
Malta	n.s.	231	n.s.	0	0	-
Monaco	0	-	-	-	0	-
Netherlands	365	178	65	80.0	0	0
Norway	9 387	92	863	78.2	2 613	47
Poland	9 192	203	1 864	94.4	-	-
Portugal	3 783	93	350	66.3	84	16
Republic of Moldova	329	141	47	62.3	31	2
Romania	6 370	212	1 347	98.0	258	-
Russian Federation	808 790	100	80 479	49.2	74 185	1 651
San Marino	n.s.	-	-	-	0	-
Serbia and Montenegro	2 694	121	327	-	808	3
Slovakia	1 929	256	494	84.7	-	-
Slovenia	1 264	283	357	91.3	44	3
Spain	17 915	50	888	77.6	10 299	1
Sweden	27 528	115	3 155	76.8	3 257	36
Switzerland	1 221	368	449	82.4	67	-
The former Yugoslav Republic of Macedonia	906	70	63	-	82	-
Ukraine	9 575	221	2 119	63.8	41	1
United Kingdom	2 845	120	340	88.2	20	1
Total Europe	**1 001 394**	**107**				
Anguilla	6	-	-	-	-	-
Antigua and Barbuda	9	-	-	-	16	-
Aruba	n.s.	-	-	-	0	-
Bahamas	515	13	7	-	36	-
Barbados	2	-	-	-	-	-
Bermuda	1	-	-	-	0	-
British Virgin Islands	4	-	-	-	2	-
Cayman Islands	12	-	-	-	4	-
Cuba	2 713	90	243	78.6	260	-
Dominica	46	-	-	-	n.s.	-
Dominican Republic	1 376	47	64	-	678	-
Grenada	4	-	-	-	5	-
Guadeloupe	80	-	-	-	2	-
Haiti	105	65	7	-	-	-
Jamaica	339	156	53	2.1	188	24
Martinique	46	-	-	-	-	-
Montserrat	4	-	-	-	-	-

TABLE 11
Growing stock[a] in forest and other wooded land 2005

Country/area	Forest				Other wooded land	
	Area (1 000 ha)	Growing stock			Area (1 000 ha)	Total growing stock (million m³)
		By area (m³/ha)	Total (million m³)	Commercial (%)		
Netherlands Antilles	1	-	-	-	33	-
Puerto Rico	408	65	26	-	-	-
Saint Kitts and Nevis	5	-	-	-	6	-
Saint Lucia	17	-	-	-	5	-
Saint Vincent and the Grenadines	11	-	-	-	2	-
Trinidad and Tobago	226	88	20	55.0	74	-
Turks and Caicos Islands	34	-	-	-	-	-
United States Virgin Islands	10	15	n.s.	-	-	-
Total Caribbean	**5 974**	**74**				
Belize	1 653	96	159	-	115	2
Costa Rica	2 391	104	249	66.3	10	-
El Salvador	298	-	-	-	201	-
Guatemala	3 938	163	642	15.5	1 672	-
Honduras	4 648	116	540	-	710	-
Nicaragua	5 189	114	591	24.9	1 022	-
Panama	4 294	160	686	1.3	1 288	n.s.
Total Central America	**22 411**	**130**				
Canada	310 134	106	32 983	100	91 951	-
Greenland	n.s.	-	-	-	8	-
Mexico	64 238	-	-	-	19 908	-
Saint Pierre and Miquelon	3	-	-	-	-	-
United States of America	303 089	116	35 118	78.7	-	-
Total North America	**677 464**	**111**				
Total North and Central America	**705 849**	**111**				
American Samoa	18	104	2	-	-	-
Australia	163 678	-	-	-	421 590	-
Cook Islands	16	-	-	-	-	-
Fiji	1 000	-	-	-	-	-
French Polynesia	105	-	-	-	-	-
Guam	26	-	-	-	0	-
Kiribati	2	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-
Micronesia (Federated States of)	63	-	-	-	-	-
Nauru	0	-	-	-	0	-
New Caledonia	717	55	40	58.2	787	-
New Zealand	8 309	-	-	-	2 557	-
Niue	14	-	-	-	-	-
Northern Mariana Islands	33	-	-	-	-	-
Palau	40	-	-	-	-	-
Papua New Guinea	29 437	35	1 035	50.7	4 474	-
Pitcairn	4	-	-	-	0	-
Samoa	171	-	-	-	22	-
Solomon Islands	2 172	-	-	-	-	-
Tokelau	0	-	-	-	0	-

TABLE 11

Growing stock[a] in forest and other wooded land 2005

Country/area	Forest				Other wooded land	
	Area *(1 000 ha)*	Growing stock			Area *(1 000 ha)*	Total growing stock *(million m³)*
		By area *(m³/ha)*	Total *(million m³)*	Commercial *(%)*		
Tonga	4	-	-	-	1	-
Tuvalu	1	-	-	-	0	-
Vanuatu	440	-	-	-	476	-
Wallis and Futuna Islands	5	-	-	-	1	-
Total Oceania	**206 254**	**36**				
Argentina	33 021	55	1 826	67.1	60 961	-
Bolivia	58 740	74	4 360	15.5	2 473	-
Brazil	477 698	170	81 239	18.1	-	-
Chile	16 121	117	1 882	64.3	13 241	-
Colombia	60 728	-	-	-	18 202	-
Ecuador	10 853	-	-	-	1 448	-
Falkland Islands	0	-	-	-	0	-
French Guiana	8 063	350	2 822	0.3	0	0
Guyana	15 104	-	-	-	3 580	-
Paraguay	18 475	-	-	-	-	-
Peru	68 742	-	-	-	22 132	-
South Georgia and the South Sandwich Islands	0	-	-	-	0	-
Suriname	14 776	150	2 216	-	-	-
Uruguay	1 506	79	118	6.2	4	-
Venezuela (Bolivarian Republic of)	47 713	-	-	-	7 369	-
Total South America	**831 540**	**155**				
WORLD	**3 952 025**	**110**				

[a] Growing stock refers to volume over bark of all living trees.

[b] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 12
Annual change in growing stock 1990–2005

Country/area	Growing stock (1 000 m³/year)		Growing stock per hectare (m³/ha/year)	
	1990–2000	2000–2005	1990–2000	2000–2005
Angola	-4 870	-4 860	n.s.	n.s.
Botswana[a]	-1 936	-1 964	n.s.	n.s.
British Indian Ocean Territory	-	-	-	-
Comoros	-87	-153	1.54	-3.32
Kenya	-1 346	-1 256	-0.09	-0.08
Lesotho	-	-	-	-
Madagascar	-11 400	-6 400	n.s.	n.s.
Malawi	-3 600	-3 600	n.s.	0.01
Mauritius	-6	-18	0.06	-0.04
Mayotte	-	-	-	-
Mozambique	-1 270	-1 280	n.s.	n.s.
Namibia	-1 800	-1 800	-0.01	n.s.
Réunion	-	-	-	-
Seychelles	0	0	0	0
South Africa	0	0	0	0
Swaziland	-30	-40	-0.43	-0.40
Uganda	-3 730	-3 800	n.s.	-0.02
United Republic of Tanzania	-14 700	-16 400	n.s.	-0.04
Zambia	-13 700	-13 880	n.s.	n.s.
Zimbabwe	-10 500	-10 600	0.01	0.01
Total Eastern and Southern Africa				
Algeria	2 708	2 031	n.s.	n.s.
Burkina Faso	-4 100	-4 200	-0.45	-0.49
Chad	-1 500	-1 400	n.s.	n.s.
Djibouti	0	0	0	0
Egypt	180	192	n.s.	n.s.
Eritrea	-	-	-	-
Ethiopia	-4 210	-4 220	-0.07	-0.08
Libyan Arab Jamahiriya	0	0	0	0
Mali[a]	-1 513	-1 557	n.s.	n.s.
Mauritania	-196	-200	0	0
Morocco	2 000	2 000	0.43	0.39
Niger	-629	-109	n.s.	0.01
Somalia	-1 688	-1 666	n.s.	n.s.
Sudan	-8 200	-8 200	n.s.	n.s.
Tunisia	800	400	-0.04	-0.10
Western Sahara	0	0	0	0
Total Northern Africa				
Benin	-	-	-	-
Burundi	-	-	-	-
Cameroon	-13 600	-13 600	n.s.	n.s.
Cape Verde	350	40	n.s.	-0.04
Central African Republic	-5 000	-4 800	n.s.	0.01
Congo	-3 500	-3 400	n.s.	n.s.
Côte d'Ivoire	3 000	13 000	0.03	0.87
Democratic Republic of the Congo	-122 800	-73 800	n.s.	n.s.

TABLE 12
Annual change in growing stock 1990–2005

Country/area	Growing stock *(1 000 m³/year)*		Growing stock per hectare *(m³/ha/year)*	
	1990–2000	2000–2005	1990–2000	2000–2005
Equatorial Guinea	-1 000	-1 000	n.s.	n.s.
Gabon	-2 200	-2 200	n.s.	n.s.
Gambia	70	70	n.s.	-0.01
Ghana	-7 100	-6 200	0.10	0.08
Guinea	-3 900	-2 800	n.s.	n.s.
Guinea-Bissau	0	-200	0.10	0.02
Liberia	-9 525	-9 526	n.s.	n.s.
Nigeria	-45 000	-45 000	0.30	0.47
Rwanda	-3 519	10 630	-11.89	16.42
Saint Helena	-	-	-	-
Sao Tome and Principe	0	0	0	0
Senegal	-1 700	-1 600	n.s.	0.01
Sierra Leone	-	-	-	-
Togo	-	-	-	-
Total Western and Central Africa				
Total Africa				
China	186 560	181 400	0.31	-0.52
Democratic People's Republic of Korea	-7 523	-6 872	0.14	0.18
Japan	74 200	79 200	3.02	3.19
Mongolia	-10 800	-10 800	n.s.	n.s.
Republic of Korea	15 900	19 000	2.57	3.10
Total East Asia				
Bangladesh	-330	-240	-0.38	-0.18
Bhutan	5 700	5 800	1.22	1.18
Brunei Darussalam	-547	-438	n.s.	n.s.
Cambodia	-14 900	-22 200	-0.11	-0.11
India	29 900	7 200	0.08	0.08
Indonesia	-542 000	-561 200	-3.33	-4.61
Lao People's Democratic Republic	-4 600	-4 600	n.s.	n.s.
Malaysia	24 500	6 800	1.94	1.94
Maldives	-	-	-	-
Myanmar	-9 200	-14 200	0.73	0.74
Nepal	23 000	-9 400	8.16	n.s.
Pakistan	-5 000	-5 200	-0.36	-0.49
Philippines	-44 300	-26 800	0.13	0.08
Singapore	-	-	-	-
Sri Lanka	-981	-1 038	-0.16	-0.19
Thailand	-4 800	-2 400	n.s.	n.s.
Timor-Leste	-	-	-	-
Viet Nam	13 570	11 183	-0.26	-0.40
Total South and Southeast Asia				
Afghanistan	-461	-464	n.s.	0
Armenia	-93	-520	1.21	0.10
Azerbaijan	0	0	0	0

TABLE 12
Annual change in growing stock 1990–2005

Country/area	Growing stock (1 000 m³/year)		Growing stock per hectare (m³/ha/year)	
	1990–2000	2000–2005	1990–2000	2000–2005
Bahrain	-	-	-	-
Cyprus	52	15	-0.01	n.s.
Georgia	2 740	2 740	0.99	0.99
Iran (Islamic Republic of)	100	2 000	0.01	0.18
Iraq	-	-	-	-
Israel	39	50	0.01	-0.01
Jordan	0	0	0	0
Kazakhstan	-215	38	0.12	0.19
Kuwait	-	-	-	-
Kyrgyzstan	537	536	0.56	0.54
Lebanon	-	-	-	-
Occupied Palestinian Territory	-	-	-	-
Oman	-	-	-	-
Qatar	-	-	-	-
Saudi Arabia	0	0	0	0
Syrian Arab Republic	-	-	-	-
Tajikistan	-40	-40	-0.10	-0.10
Turkey	9 890	5 679	0.50	0.23
Turkmenistan	10	100	n.s.	0.02
United Arab Emirates	319	13	n.s.	-0.02
Uzbekistan	817	1 130	0.24	0.31
Yemen[a]	0	0	0	0
Total Western and Central Asia				
Total Asia				
Albania	60	540	0.33	0.06
Andorra	-	-	-	-
Austria	14 100	14 200	3.27	3.32
Belarus	14 400	14 400	0.86	1.63
Belgium	2 940	2 980	4.69	4.47
Bosnia and Herzegovina	6 700	6 600	3.22	3.02
Bulgaria	12 100	8 400	3.41	0.17
Channel Islands	-	-	-	-
Croatia	2 700	2 800	1.18	1.22
Czech Republic	7 370	7 360	2.73	2.56
Denmark	940	440	0.70	0.02
Estonia	-	-2 120	-	-1.66
Faeroe Islands	-	-	-	-
Finland	16 260	17 600	0.62	0.76
France	17 500	42 200	0.38	2.33
Germany	62 200	-	4.84	-
Gibraltar	-	-	-	-
Greece	1 400	1 400	-0.01	-0.01
Holy See	-	-	-	-
Hungary	3 716	2 367	1.06	0.01
Iceland	40	60	-2.09	-1.17
Ireland	740	1 120	-2.06	-0.09
Isle of Man	-	-	-	-

TABLE 12
Annual change in growing stock 1990–2005

Country/area	Growing stock *(1 000 m³/year)*		Growing stock per hectare *(m³/ha/year)*	
	1990–2000	2000–2005	1990–2000	2000–2005
Italy	23 800	31 560	1.11	1.71
Latvia	9 500	10 600	2.67	2.88
Liechtenstein	10	0	-0.02	0
Lithuania	5 270	5 400	2.00	1.18
Luxembourg	557	0	6.16	0
Malta	0	0	0	0
Monaco	-	-	-	-
Netherlands	900	800	1.87	1.73
Norway	10 800	10 800	1.02	0.99
Poland	25 120	25 660	2.44	2.24
Portugal	7 500	7 400	1.06	1.03
Republic of Moldova	631	701	1.69	1.89
Romania	-110	180	n.s.	n.s.
Russian Federation	23 075	41 732	0.02	0.06
San Marino	-	-	-	-
Serbia and Montenegro	3 600	3 800	1.00	1.02
Slovakia	6 160	6 240	3.22	3.03
Slovenia	6 122	4 532	4.00	2.50
Spain	19 800	19 600	0.41	0.30
Sweden	24 240	24 240	0.84	0.84
Switzerland	4 400	4 000	2.45	1.99
The former Yugoslav Republic of Macedonia	0	0	0	0
Ukraine	47 000	47 000	4.56	4.64
United Kingdom	4 200	6 400	0.84	1.85
Total Europe				
Anguilla	-	-	-	-
Antigua and Barbuda	-	-	-	-
Aruba	-	-	-	-
Bahamas	0	0	0	0
Barbados	-	-	-	-
Bermuda	-	-	-	-
British Virgin Islands	-	-	-	-
Cayman Islands	-	-	-	-
Cuba	7 500	7 600	2.10	1.08
Dominica	-	-	-	-
Dominican Republic	0	0	0	0
Grenada	-	-	-	-
Guadeloupe	-	-	-	-
Haiti	-44	-44	0.01	0.08
Jamaica	-100	0	-0.11	0.18
Martinique	-	-	-	-
Montserrat	-	-	-	-
Netherlands Antilles	-	-	-	-
Puerto Rico	-57	-58	-0.19	-0.17
Saint Kitts and Nevis	-	-	-	-
Saint Lucia	-	-	-	-

TABLE 12
Annual change in growing stock 1990–2005

Country/area	Growing stock (1 000 m³/year)		Growing stock per hectare (m³/ha/year)	
	1990–2000	2000–2005	1990–2000	2000–2005
Saint Vincent and the Grenadines	-	-	-	-
Trinidad and Tobago	-100	0	-0.16	0.16
Turks and Caicos Islands	-	-	-	-
United States Virgin Islands	-1	-2	0.09	0.02
Total Caribbean				
Belize	0	0	0	0
Costa Rica	-1 940	200	0.01	-0.05
El Salvador	-	-	-	-
Guatemala	-8 806	-8 806	n.s.	n.s.
Honduras	-16 800	-12 800	0.67	0.99
Nicaragua	-11 400	-8 000	n.s.	n.s.
Panama	-9 200	-8 200	-1.84	-1.81
Total Central America				
Canada	0	0	0	0
Greenland	-	-	-	-
Mexico	-	-	-	-
Saint Pierre and Miquelon	-	-	-	-
United States of America	189 600	210 000	0.50	0.63
Total North America				
Total North and Central America				
American Samoa	-4	-4	n.s.	n.s.
Australia	-	-	-	-
Cook Islands	-	-	-	-
Fiji	-	-	-	-
French Polynesia	-	-	-	-
Guam	-	-	-	-
Kiribati	-	-	-	-
Marshall Islands	-	-	-	-
Micronesia (Federated States of)	-	-	-	-
Nauru	-	-	-	-
New Caledonia	0	0	0	0
New Zealand	-	-	-	-
Niue	-	-	-	-
Northern Mariana Islands	-	-	-	-
Palau	-	-	-	-
Papua New Guinea	-5 050	-5 060	n.s.	-0.01
Pitcairn	-	-	-	-
Samoa	-	-	-	-
Solomon Islands	-	-	-	-
Tokelau	-	-	-	-
Tonga	-	-	-	-
Tuvalu	-	-	-	-
Vanuatu	-	-	-	-
Wallis and Futuna Islands	-	-	-	-
Total Oceania				

TABLE 12
Annual change in growing stock 1990–2005

Country/area	Growing stock *(1 000 m³/year)*		Growing stock per hectare *(m³/ha/year)*	
	1990–2000	2000–2005	1990–2000	2000–2005
Argentina	-20 100	-21 200	-0.33	-0.38
Bolivia	-20 100	-20 000	n.s.	n.s.
Brazil	-376 499	-698 892	0.16	-0.35
Chile	22 420	22 640	1.05	1.01
Colombia	-	-	-	-
Ecuador	-	-	-	-
Falkland Islands	-	-	-	-
French Guiana	-1 000	0	n.s.	0
Guyana	-	-	-	-
Paraguay	-	-	-	-
Peru	-	-	-	-
South Georgia and the South Sandwich Islands	-	-	-	-
Suriname	0	0	0	0
Uruguay	-	-	-	-
Venezuela (Bolivarian Republic of)	-	-	-	-
Total South America				
WORLD				

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 13

Biomass stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Forest				Other wooded land			
	Above-ground biomass	Below-ground biomass	Dead wood	Total	Above-ground biomass	Below-ground biomass	Dead wood	Total
Angola	7 605	2 053	1 076	10 734	-	-	-	-
Botswana[a]	228	55	-	-	665	159	-	-
British Indian Ocean Territory	-	-	-	-	-	-	-	-
Comoros	1	n.s.	n.s.	2	-	-	-	-
Kenya	536	133	74	743	-	-	-	-
Lesotho	-	-	-	-	n.s.	n.s.	n.s.	1
Madagascar	4 778	1 481	382	6 641	-	-	-	-
Malawi	260	62	-	-	-	-	-	-
Mauritius	6	2	1	9	2	n.s.	n.s.	2
Mayotte	-	-	-	-	-	-	-	-
Mozambique	978	235	170	1 382	1 728	829	358	2 915
Namibia	364	98	65	527	231	62	41	335
Réunion	-	-	-	-	-	-	-	-
Seychelles	6	1	-	-	-	-	-	-
South Africa	1 302	346	231	1 878	1 242	596	257	2 095
Swaziland	38	9	-	-	7	2	-	-
Uganda	218	59	39	315	12	6	2	19
United Republic of Tanzania	3 636	873	631	5 140	248	119	51	418
Zambia	1 821	492	324	2 636	61	16	11	88
Zimbabwe	843	226	150	1 219	-	-	-	-
Total Eastern and Southern Africa								
Algeria	183	44	-	-	-	-	-	-
Burkina Faso	469	127	108	704	-	-	-	-
Chad	371	100	-	-	114	55	-	-
Djibouti	1	n.s.	-	-	-	-	-	-
Egypt	11	3	2	16	n.s.	n.s.	n.s.	1
Eritrea	-	-	-	-	-	-	-	-
Ethiopia	396	107	70	573	365	175	76	616
Libyan Arab Jamahiriya	11	2	2	15	3	1	1	4
Mali[a]	390	94	-	-	514	123	-	-
Mauritania	10	3	-	-	-	-	-	-
Morocco	368	112	-	-	n.s.	n.s.	-	-
Niger	20	5	-	-	19	5	-	-
Somalia	624	150	108	881	-	-	-	-
Sudan	2 235	827	337	3 398	-	-	-	-
Tunisia	15	5	-	-	0	n.s.	-	-
Western Sahara	29	22	-	-	-	-	-	-
Total Northern Africa								
Benin	-	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-	-
Cameroon	2 679	1 125	387	4 191	-	-	-	-
Cape Verde	12	4	-	-	-	-	-	-
Central African Republic	4 519	1 085	414	6 018	-	-	-	-
Congo	8 356	2 005	-	-	882	212	-	-
Côte d'Ivoire	3 649	365	442	4 456	-	-	-	-
Democratic Republic of the Congo	37 376	8 970	2 432	48 778	-	-	-	-

TABLE 13
Biomass stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Forest				Other wooded land			
	Above-ground biomass	Below-ground biomass	Dead wood	Total	Above-ground biomass	Below-ground biomass	Dead wood	Total
Equatorial Guinea	186	45	30	261	-	-	-	-
Gabon	5 971	1 314	392	7 677	-	-	-	-
Gambia	53	13	9	76	10	5	2	17
Ghana	726	267	139	1 132	-	-	-	-
Guinea	1 026	246	122	1 394	-	-	-	-
Guinea-Bissau	98	24	38	160	-	-	-	-
Liberia	731	175	127	1 033	-	-	-	-
Nigeria	2 261	543	392	3 195	-	-	-	-
Rwanda	75	13	n.s.	88	17	3	1	21
Saint Helena	-	-	-	-	-	-	-	-
Sao Tome and Principe	6	3	0	10	-	-	-	-
Senegal	566	175	28	769	38	12	2	52
Sierra Leone	-	-	-	-	-	-	-	-
Togo	-	-	-	-	-	-	-	-
Total Western and Central Africa								
Total Africa								
China	9 271	2 920	1 836	14 027	577	219	138	934
Democratic People's Republic of Korea	340	125	68	532	-	-	-	-
Japan	3 052	733	-	-	-	-	-	-
Mongolia	870	278	230	1 378	1	n.s.	n.s.	1
Republic of Korea	383	132	57	572	-	-	-	-
Total East Asia								
Bangladesh	51	12	7	70	-	-	-	-
Bhutan	503	187	76	766	-	-	-	-
Brunei Darussalam	63	15	9	87	-	-	-	-
Cambodia	1 904	628	279	2 811	-	-	-	-
India	4 093	1 085	570	5 748	-	-	-	-
Indonesia	8 867	2 926	1 297	13 090	-	-	-	-
Lao People's Democratic Republic	2 342	632	327	3 301	78	21	11	110
Malaysia	5 661	1 359	1 053	8 073	-	-	-	-
Maldives	-	-	-	-	-	-	-	-
Myanmar	5 109	1 226	697	7 032	-	-	-	-
Nepal	718	251	145	1 114	63	22	13	98
Pakistan	381	135	57	573	-	-	-	-
Philippines	1 566	376	214	2 156	-	-	-	-
Singapore	-	-	-	-	-	-	-	-
Sri Lanka	64	15	9	88	-	-	-	-
Thailand	1 129	305	158	1 592	-	-	-	-
Timor-Leste	-	-	-	-	-	-	-	-
Viet Nam	1 893	455	258	2 606	-	-	-	-
Total South and Southeast Asia								
Afghanistan	9	4	1	14	-	-	-	-
Armenia	27	9	5	41	1	n.s.	n.s.	1
Azerbaijan	99	17	-	-	-	-	-	-

TABLE 13

Biomass stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Forest				Other wooded land			
	Above-ground biomass	Below-ground biomass	Dead wood	Total	Above-ground biomass	Below-ground biomass	Dead wood	Total
Bahrain	-	-	-	-	-	-	-	-
Cyprus	4	1	-	-	-	-	-	-
Georgia	334	86	59	479	-	-	-	-
Iran (Islamic Republic of)	516	153	94	763	-	-	-	-
Iraq	-	-	-	-	-	-	-	-
Israel	-	-	-	-	-	-	-	-
Jordan	3	1	1	5	-	-	-	-
Kazakhstan	211	63	38	312	10	3	2	14
Kuwait	-	-	-	-	-	-	-	-
Kyrgyzstan	17	8	-	-	-	-	-	-
Lebanon	3	1	-	-	n.s.	n.s.	-	-
Occupied Palestinian Territory	-	-	-	-	-	-	-	-
Oman	-	-	-	-	-	-	-	-
Qatar	-	-	-	-	-	-	-	-
Saudi Arabia	28	7	5	40	205	55	36	297
Syrian Arab Republic	-	-	-	-	-	-	-	-
Tajikistan	4	2	n.s.	6	1	n.s.	-	-
Turkey	1 400	233	-	-	-	-	-	-
Turkmenistan	17	17	5	40	-	-	-	-
United Arab Emirates	23	10	5	38	n.s.	n.s.	n.s.	n.s.
Uzbekistan	17	7	4	28	-	-	-	-
Yemen[a]	7	3	1	12	18	8	4	30
Total Western and Central Asia								
Total Asia								
Albania	78	25	29	132	8	23	10	41
Andorra	-	-	-	-	-	-	-	-
Austria	773	-	-	-	-	-	-	-
Belarus	828	251	216	1 295	-	-	-	-
Belgium	104	26	3	133	-	-	-	-
Bosnia and Herzegovina	275	76	-	-	-	-	-	-
Bulgaria	395	132	-	-	-	-	-	-
Channel Islands	-	-	-	-	-	-	-	-
Croatia	304	80	54	439	-	-	-	-
Czech Republic	612	113	36	761	0	0	0	0
Denmark	40	12	-	-	-	-	-	-
Estonia	259	75	16	351	3	1	n.s.	4
Faeroe Islands	-	-	-	-	-	-	-	-
Finland	1 351	281	35	1 666	3	1	n.s.	4
France	1 850	602	-	-	-	-	-	-
Germany	2 020	585	54	2 659	-	-	-	-
Gibraltar	-	-	-	-	-	-	-	-
Greece	98	19	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-
Hungary	257	83	n.s.	340	-	-	-	-
Iceland	3	n.s.	n.s.	3	1	n.s.	n.s.	2
Ireland	33	7	n.s.	40	-	-	-	-
Isle of Man	-	-	-	-	-	-	-	-

TABLE 13
Biomass stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Forest				Other wooded land			
	Above-ground biomass	Below-ground biomass	Dead wood	Total	Above-ground biomass	Below-ground biomass	Dead wood	Total
Italy	1 043	230	159	1 431	88	37	12	137
Latvia	357	105	9	471	-	-	-	-
Liechtenstein	1	n.s.	-	-	-	-	-	-
Lithuania	210	48	21	279	1	n.s.	n.s.	2
Luxembourg	17	2	-	-	-	-	-	-
Malta	n.s.	n.s.	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Netherlands	43	9	2	54	0	0	0	0
Norway	587	103	37	727	37	4	5	46
Poland	1 379	412	13	1 804	-	-	-	-
Portugal	146	82	-	-	8	5	-	-
Republic of Moldova	24	2	-	-	1	1	-	-
Romania	904	229	181	1 314	-	-	-	-
Russian Federation	51 574	12 846	24 396	88 815	450	300	750	1 500
San Marino	-	-	-	-	-	-	-	-
Serbia and Montenegro	242	70	44	356	-	-	-	-
Slovakia	334	73	32	438	-	-	-	-
Slovenia	229	65	48	342	2	n.s.	n.s.	3
Spain	661	210	-	-	1	n.s.	-	-
Sweden	1 810	530	670	3 010	32	9	14	55
Switzerland	248	60	8	316	-	-	-	-
The former Yugoslav Republic of Macedonia	33	8	-	-	-	-	-	-
Ukraine	1 199	290	208	1 698	-	-	-	-
United Kingdom	190	34	3	227	1	0	0	1
Total Europe								
Anguilla	-	-	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-	-	-	-
Aruba	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	-	-	-	-	-	-	-	-
Bermuda	-	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-	-	-
Cuba	569	171	49	789	-	-	-	-
Dominica	-	-	-	-	-	-	-	-
Dominican Republic	132	32	24	188	-	-	-	-
Grenada	-	-	-	-	-	-	-	-
Guadeloupe	-	-	-	-	-	-	-	-
Haiti	12	5	2	19	-	-	-	-
Jamaica	55	13	8	76	34	8	5	47
Martinique	-	-	-	-	-	-	-	-
Montserrat	-	-	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-	-	-
Puerto Rico	35	7	-	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-	-	-	-
Saint Lucia	-	-	-	-	-	-	-	-

TABLE 13
Biomass stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Forest				Other wooded land			
	Above-ground biomass	Below-ground biomass	Dead wood	Total	Above-ground biomass	Below-ground biomass	Dead wood	Total
Saint Vincent and the Grenadines	-	-	-	-	-	-	-	-
Trinidad and Tobago	38	9	4	51	-	-	-	-
Turks and Caicos Islands	-	-	-	-	-	-	-	-
United States Virgin Islands	n.s.	n.s.	-	-	-	-	-	-
Total Caribbean								
Belize	94	24	18	137	1	n.s.	n.s.	1
Costa Rica	224	161	42	427	-	-	-	-
El Salvador	-	-	-	-	-	-	-	-
Guatemala	755	241	149	1 145	-	-	-	-
Honduras	-	-	-	-	-	-	-	-
Nicaragua	1 154	278	158	1 590	-	-	-	-
Panama	980	258	136	1 374	91	38	14	144
Total Central America								
Canada	-	-	-	-	-	-	-	-
Greenland	-	-	-	-	-	-	-	-
Mexico	-	-	-	-	-	-	-	-
Saint Pierre and Miquelon	-	-	-	-	-	-	-	-
United States of America	31 653	6 276	5 350	43 279	-	-	-	-
Total North America								
Total North and Central America								
American Samoa	3	1	-	-	-	-	-	-
Australia	12 929	5 581	4 909	23 419	-	-	-	-
Cook Islands	-	-	-	-	-	-	-	-
Fiji	-	-	-	-	-	-	-	-
French Polynesia	-	-	-	-	-	-	-	-
Guam	-	-	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-	-	-	-
Nauru	-	-	-	-	-	-	-	-
New Caledonia	118	28	13	160	-	-	-	-
New Zealand	-	-	-	-	-	-	-	-
Niue	-	-	-	-	-	-	-	-
Northern Mariana Islands	-	-	-	-	-	-	-	-
Palau	-	-	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-	-	-
Pitcairn	-	-	-	-	-	-	-	-
Samoa	-	-	-	-	-	-	-	-
Solomon Islands	-	-	-	-	-	-	-	-
Tokelau	-	-	-	-	-	-	-	-
Tonga	-	-	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-	-
Wallis and Futuna Islands	-	-	-	-	-	-	-	-
Total Oceania								

TABLE 13

Biomass stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Forest				Other wooded land			
	Above-ground biomass	Below-ground biomass	Dead wood	Total	Above-ground biomass	Below-ground biomass	Dead wood	Total
Argentina	3 824	993	516	5 333	-	-	-	-
Bolivia	7 828	2 740	1 163	11 731	-	-	-	-
Brazil	79 219	22 017	6 359	107 595	-	-	-	-
Chile	3 243	649	739	4 631	-	-	-	-
Colombia	11 945	4 180	2 419	18 544	3 453	1 209	699	5 361
Ecuador	-	-	-	-	-	-	-	-
Falkland Islands	-	-	-	-	-	-	-	-
French Guiana	-	-	-	-	0	0	0	0
Guyana	2 824	619	378	3 821	-	-	-	-
Paraguay	-	-	-	-	-	-	-	-
Peru	-	-	-	-	-	-	-	-
South Georgia and the South Sandwich Islands	-	-	-	-	-	-	-	-
Suriname	8 016	3 367	1 252	12 635	-	-	-	-
Uruguay	-	-	-	-	-	-	-	-
Venezuela (Bolivarian Republic of)	-	-	-	-	-	-	-	-
Total South America								
WORLD								

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 14

Carbon stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Carbon in forest					Carbon in other wooded land				
	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil
Angola	3 803	1 027	538	124	-	-	-	-	-	-
Botswana[a]	114	27	-	-	-	332	80	-	-	-
British Indian Ocean Territory	-	-	-	-	-	-	-	-	-	-
Comoros	1	n.s.	n.s.	n.s.	n.s.	-	-	-	-	-
Kenya	268	66	37	-	-	-	-	-	-	-
Lesotho	-	-	-	-	-	n.s.	n.s.	n.s.	-	-
Madagascar	2 389	741	191	-	-	-	-	-	-	-
Malawi	130	31	-	-	-	-	-	-	-	-
Mauritius	3	1	1	-	-	1	n.s.	n.s.	-	-
Mayotte	-	-	-	-	-	-	-	-	-	-
Mozambique	489	117	85	-	-	864	415	179	-	-
Namibia	182	49	32	-	-	116	31	21	-	-
Réunion	-	-	-	-	-	-	-	-	-	-
Seychelles	3	1	-	-	-	-	-	-	-	-
South Africa	651	173	115	-	-	621	298	129	-	-
Swaziland	19	4	-	-	-	3	1	-	-	-
Uganda	109	29	19	-	-	6	3	1	-	-
United Republic of Tanzania	1 818	436	316	-	-	124	60	26	-	-
Zambia	910	246	162	-	-	30	8	5	-	-
Zimbabwe	422	113	75	-	-	-	-	-	-	-
Total Eastern and Southern Africa										
Algeria	92	22	-	-	86	-	-	-	-	-
Burkina Faso	235	63	54	-	-	-	-	-	-	-
Chad	186	50	-	25	-	57	28	-	-	-
Djibouti	n.s.	n.s.	-	-	-	-	-	-	-	-
Egypt	6	1	1	n.s.	3	n.s.	n.s.	n.s.	n.s.	1
Eritrea	-	-	-	-	-	-	-	-	-	-
Ethiopia	198	54	35	-	-	182	88	38	-	-
Libyan Arab Jamahiriya	5	1	1	n.s.	-	1	n.s.	n.s.	2	-
Mali[a]	195	47	-	26	-	257	61	-	35	-
Mauritania	5	2	-	-	-	-	-	-	-	-
Morocco	184	56	-	-	-	n.s.	n.s.	-	-	-
Niger	10	2	-	3	47	10	3	-	8	48
Somalia	312	75	54	-	-	-	-	-	-	-
Sudan	1 117	413	168	-	-	-	-	-	-	-
Tunisia	7	3	-	1	38	n.s.	n.s.	-	-	6
Western Sahara	14	11	-	-	-	-	-	-	-	-
Total Northern Africa										
Benin	-	-	-	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-	-	-	-
Cameroon	1 339	563	193	-	-	-	-	-	-	-
Cape Verde	6	2	-	-	-	-	-	-	-	-
Central African Republic	2 259	542	207	-	-	-	-	-	-	-
Congo	4 178	1 003	-	-	-	441	106	-	-	-
Côte d'Ivoire	1 679	185	203	22	584	-	-	-	-	-
Democratic Republic of the Congo	18 688	4 485	1 216	281	7 482	-	-	-	-	-

TABLE 14

Carbon stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Carbon in forest					Carbon in other wooded land				
	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil
Equatorial Guinea	93	22	15	-	-	-	-	-	-	-
Gabon	2 986	657	196	-	-	-	-	-	-	-
Gambia	27	6	5	-	-	5	2	1	-	-
Ghana	363	133	70	-	-	-	-	-	-	-
Guinea	513	123	61	-	-	-	-	-	-	-
Guinea-Bissau	49	12	19	-	-	-	-	-	-	-
Liberia	365	88	63	-	-	-	-	-	-	-
Nigeria	1 130	271	196	-	-	-	-	-	-	-
Rwanda	38	6	n.s.	2	23	9	1	1	n.s.	3
Saint Helena	-	-	-	-	-	-	-	-	-	-
Sao Tome and Principe	3	1	n.s.	-	-	-	-	-	-	-
Senegal	283	88	14	-	-	19	6	1	-	-
Sierra Leone	-	-	-	-	-	-	-	-	-	-
Togo	-	-	-	-	-	-	-	-	-	-
Total Western and Central Africa										
Total Africa										
China	4 636	1 460	918	-	-	289	109	69	-	-
Democratic People's Republic of Korea	170	62	34	-	-	-	-	-	-	-
Japan	1 526	366	-	-	-	-	-	-	-	-
Mongolia	435	139	115	-	-	n.s.	n.s.	n.s.	-	-
Republic of Korea	192	66	28	-	-	-	-	-	-	-
Total East Asia										
Bangladesh	25	6	3	1	-	-	-	-	-	-
Bhutan	251	94	38	70	223	-	-	-	-	-
Brunei Darussalam	32	8	4	6	-	-	-	-	-	-
Cambodia	952	314	139	21	-	-	-	-	-	-
India	1 852	491	258	222	7 181	-	-	-	-	-
Indonesia	4 434	1 463	649	179	-	-	-	-	-	-
Lao People's Democratic Republic	1 171	316	164	34	-	39	11	5	10	-
Malaysia	2 831	679	526	-	-	-	-	-	-	-
Maldives	-	-	-	-	-	-	-	-	-	-
Myanmar	2 555	613	348	68	-	-	-	-	-	-
Nepal	359	126	73	13	326	32	11	6	7	170
Pakistan	191	68	28	4	-	-	-	-	-	-
Philippines	783	188	107	15	-	-	-	-	-	-
Singapore	-	-	-	-	-	-	-	-	-	-
Sri Lanka	32	8	4	4	-	-	-	-	-	-
Thailand	564	152	79	-	-	-	-	-	-	-
Timor-Leste	-	-	-	-	-	-	-	-	-	-
Viet Nam	947	227	129	27	623	-	-	-	-	-
Total South and Southeast Asia										
Afghanistan	4	2	1	-	-	-	-	-	-	-
Armenia	13	5	3	10	13	-	-	-	-	-
Azerbaijan	49	9	-	-	-	-	-	-	-	-

TABLE 14

Carbon stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Carbon in forest					Carbon in other wooded land				
	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil
Bahrain	-	-	-	-	-	-	-	-	-	-
Cyprus	2	1	-	-	4	-	-	-	-	5
Georgia	167	43	29	54	196	-	-	-	-	-
Iran (Islamic Republic of)	258	76	47	-	-	-	-	-	-	-
Iraq	-	-	-	-	-	-	-	-	-	-
Israel	-	-	-	-	-	-	-	-	-	-
Jordan	2	1	n.s.	n.s.	-	-	-	-	-	-
Kazakhstan	105	31	19	-	-	5	1	1	-	-
Kuwait	-	-	-	-	-	-	-	-	-	-
Kyrgyzstan	8	4	-	-	-	-	-	-	-	-
Lebanon	1	n.s.	-	-	-	n.s.	n.s.	-	-	-
Occupied Palestinian Territory	-	-	-	-	-	-	-	-	-	-
Oman	-	-	-	-	-	-	-	-	-	-
Qatar	-	-	-	-	-	-	-	-	-	-
Saudi Arabia	14	4	2	6	-	102	28	18	72	-
Syrian Arab Republic	-	-	-	-	-	-	-	-	-	-
Tajikistan	2	1	n.s.	-	28	n.s.	n.s.	-	-	3
Turkey	700	117	-	-	-	-	-	-	-	-
Turkmenistan	9	9	2	-	79	-	-	-	-	-
United Arab Emirates	12	5	2	1	-	n.s.	n.s.	n.s.	n.s.	-
Uzbekistan	9	4	2	-	-	-	-	-	-	-
Yemen[a]	4	2	1	-	-	9	4	2	-	-
Total Western and Central Asia										
Total Asia										
Albania	39	13	15	12	70	4	11	5	4	24
Andorra	-	-	-	-	-	-	-	-	-	-
Austria	379	-	-	-	474	-	-	-	-	-
Belarus	414	125	108	227	468	-	-	-	-	-
Belgium	52	13	1	14	47	-	-	-	-	-
Bosnia and Herzegovina	138	38	-	-	-	-	-	-	-	-
Bulgaria	197	66	-	-	-	-	-	-	-	-
Channel Islands	-	-	-	-	-	-	-	-	-	-
Croatia	152	40	27	-	-	-	-	-	-	-
Czech Republic	276	51	16	39	190	0	0	0	0	0
Denmark	20	6	-	-	-	-	-	-	-	-
Estonia	130	38	8	-	356	1	n.s.	n.s.	-	13
Faeroe Islands	-	-	-	-	-	-	-	-	-	-
Finland	675	140	15	-	-	2	n.s.	n.s.	-	-
France	879	286	-	125	1 015	-	-	-	-	-
Germany	1 010	293	27	-	858	-	-	-	-	-
Gibraltar	-	-	-	-	-	-	-	-	-	-
Greece	49	10	-	-	-	-	-	-	-	-
Holy See	-	-	-	-	-	-	-	-	-	-
Hungary	131	42	n.s.	56	73	-	-	-	-	-
Iceland	1	n.s.	n.s.	n.s.	4	1	n.s.	n.s.	n.s.	8
Ireland	16	3	n.s.	-	-	-	-	-	-	-
Isle of Man	-	-	-	-	-	-	-	-	-	-

TABLE 14

Carbon stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Carbon in forest					Carbon in other wooded land				
	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil
Italy	521	115	80	67	825	44	18	6	8	128
Latvia	178	52	5	64	284	-	-	-	-	-
Liechtenstein	n.s.	n.s.	-	-	-	-	-	-	-	-
Lithuania	105	24	10	50	151	1	n.s.	n.s.	2	6
Luxembourg	8	1	-	-	-	-	-	-	-	-
Malta	n.s.	n.s.	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-	-	-
Netherlands	21	4	1	9	40	0	0	0	0	0
Norway	293	51	19	-	-	19	2	2	-	-
Poland	690	206	7	-	-	-	-	-	-	-
Portugal	73	41	-	-	-	4	2	-	-	-
Republic of Moldova	12	1	-	-	-	n.s.	0	-	-	-
Romania	452	115	91	59	723	-	-	-	-	-
Russian Federation	25 787	6 423	12 198	4 500	137 000	225	150	375	-	2 000
San Marino	-	-	-	-	-	-	-	-	-	-
Serbia and Montenegro	121	35	22	-	-	-	-	-	-	-
Slovakia	167	36	16	21	270	-	-	-	-	-
Slovenia	115	32	24	-	89	1	n.s.	n.s.	-	3
Spain	297	95	-	-	-	n.s.	n.s.	-	-	-
Sweden	905	265	335	-	-	16	5	7	-	-
Switzerland	124	30	4	16	93	-	-	-	-	-
The former Yugoslav Republic of Macedonia	16	4	-	-	-	-	-	-	-	-
Ukraine	600	145	104	-	-	-	-	-	-	-
United Kingdom	95	17	2	25	719	0	0	0	0	3
Total Europe										
Anguilla	-	-	-	-	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-	-	-	-	-	-
Aruba	-	-	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-	-	-
Barbados	-	-	-	-	-	-	-	-	-	-
Bermuda	-	-	-	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-	-	-	-	-
Cuba	267	80	23	-	187	-	-	-	-	-
Dominica	-	-	-	-	-	-	-	-	-	-
Dominican Republic	66	16	12	-	-	-	-	-	-	-
Grenada	-	-	-	-	-	-	-	-	-	-
Guadeloupe	-	-	-	-	-	-	-	-	-	-
Haiti	6	2	1	-	-	-	-	-	-	-
Jamaica	27	7	4	1	28	19	5	3	n.s.	13
Martinique	-	-	-	-	-	-	-	-	-	-
Montserrat	-	-	-	-	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-	-	-	-	-
Puerto Rico	18	3	-	-	-	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-	-	-	-	-	-
Saint Lucia	-	-	-	-	-	-	-	-	-	-

TABLE 14

Carbon stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Carbon in forest					Carbon in other wooded land				
	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil
Saint Vincent and the Grenadines	-	-	-	-	-	-	-	-	-	-
Trinidad and Tobago	19	5	2	-	-	-	-	-	-	-
Turks and Caicos Islands	-	-	-	-	-	-	-	-	-	-
United States Virgin Islands	n.s.	n.s.	-	-	-	-	-	-	-	-
Total Caribbean										
Belize	47	12	9	-	-	n.s.	1	n.s.	-	-
Costa Rica	112	81	21	-	-	-	-	-	-	-
El Salvador	-	-	-	-	-	-	-	-	-	-
Guatemala	377	121	74	-	-	-	-	-	-	-
Honduras	-	-	-	-	-	-	-	-	-	-
Nicaragua	577	139	79	-	-	-	-	-	-	-
Panama	490	130	68	9	186	46	19	7	1	62
Total Central America										
Canada	-	-	-	-	-	-	-	-	-	-
Greenland	-	-	-	-	-	-	-	-	-	-
Mexico	-	-	-	-	-	-	-	-	-	-
Saint Pierre and Miquelon	-	-	-	-	-	-	-	-	-	-
United States of America	15 826	3 138	2 675	4 657	15 732	-	-	-	-	-
Total North America										
Total North and Central America										
American Samoa	2	n.s.	-	-	-	-	-	-	-	-
Australia	5 824	2 515	2 209	-	-	-	-	-	-	-
Cook Islands	-	-	-	-	-	-	-	-	-	-
Fiji	-	-	-	-	-	-	-	-	-	-
French Polynesia	-	-	-	-	-	-	-	-	-	-
Guam	-	-	-	-	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-	-	-	-	-	-
Nauru	-	-	-	-	-	-	-	-	-	-
New Caledonia	59	14	7	2	-	-	-	-	-	-
New Zealand	-	-	-	-	-	-	-	-	-	-
Niue	-	-	-	-	-	-	-	-	-	-
Northern Mariana Islands	-	-	-	-	-	-	-	-	-	-
Palau	-	-	-	-	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-	-	-	-	-
Pitcairn	-	-	-	-	-	-	-	-	-	-
Samoa	-	-	-	-	-	-	-	-	-	-
Solomon Islands	-	-	-	-	-	-	-	-	-	-
Tokelau	-	-	-	-	-	-	-	-	-	-
Tonga	-	-	-	-	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-	-	-	-
Wallis and Futuna Islands	-	-	-	-	-	-	-	-	-	-
Total Oceania										

TABLE 14

Carbon stock in forest and other wooded land 2005 *(million tonnes)*

Country/area	Carbon in forest					Carbon in other wooded land				
	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil	In above-ground biomass	In below-ground biomass	In dead wood	In litter	In soil
Argentina	1 912	499	260	124	1 264	-	-	-	-	-
Bolivia	3 926	1 370	581	-	-	-	-	-	-	-
Brazil	38 480	10 855	3 056	1 958	50 289	-	-	-	-	-
Chile	1 622	324	370	136	780	-	-	-	-	-
Colombia	5 972	2 090	1 209	-	-	1 726	604	350	-	-
Ecuador	-	-	-	-	-	-	-	-	-	-
Falkland Islands	-	-	-	-	-	-	-	-	-	-
French Guiana	-	-	-	-	-	0	0	0	0	0
Guyana	1 412	310	190	121	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-	-	-	-	-
Peru	-	-	-	-	-	-	-	-	-	-
South Georgia and the South Sandwich Islands	-	-	-	-	-	-	-	-	-	-
Suriname	4 008	1 684	626	-	-	-	-	-	-	-
Uruguay	-	-	-	-	-	-	-	-	-	-
Venezuela (Bolivarian Republic of)	-	-	-	-	-	-	-	-	-	-
Total South America										
WORLD										

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has distributed these values to the categories forest and other wooded land respectively.

TABLE 15

Disturbances affecting forest and other wooded land 2000 *(1 000 ha)*

Country/area	Forest					Other wooded land				
	Total area	Area affected annually by:				Total area	Area affected annually by:			
		Fire	Insects	Diseases	Other		Fire	Insects	Diseases	Other
Angola	59 728	-	-	-	-	-	-	-	-	-
Botswana	12 535	-	-	-	-	34 791	-	-	-	-
British Indian Ocean Territory	3	-	-	-	-	0	-	-	-	-
Comoros	8	0	0	0	0	-	-	-	-	-
Kenya	3 582	3	-	-	-	35 120	-	-	-	-
Lesotho	7	-	-	-	-	55	-	-	-	-
Madagascar	13 023	33	-	-	-	18 453	839	-	-	-
Malawi	3 567	-	-	-	-	-	-	-	-	-
Mauritius	38	n.s.	-	-	n.s.	17	-	-	-	-
Mayotte	6	-	-	-	-	-	-	-	-	-
Mozambique	19 512	-	-	-	-	41 419	-	-	-	-
Namibia	8 033	438	-	-	4	8 656	-	-	-	-
Réunion	87	n.s.	-	-	-	54	-	-	-	-
Seychelles	40	n.s.	n.s.	n.s.	-	-	-	-	-	-
South Africa	9 203	-	-	-	-	21 409	-	-	-	-
Swaziland	518	-	-	-	-	276	-	-	-	-
Uganda	4 059	-	-	-	-	1 235	-	-	-	-
United Republic of Tanzania	37 318	9	-	-	-	10 629	-	-	-	-
Zambia	44 676	-	-	-	-	3 468	-	-	-	-
Zimbabwe	19 105	-	-	-	-	-	-	-	-	-
Total Eastern and Southern Africa	**235 047**									
Algeria	2 144	14	-	130	-	1 662	6	-	-	-
Burkina Faso	6 914	-	-	-	-	7 427	-	-	-	-
Chad	12 317	6 159	-	-	-	9 458	1 892	-	-	-
Djibouti	6	-	-	-	-	220	-	-	-	-
Egypt	59	-	0	n.s.	-	20	-	-	-	n.s.
Eritrea	1 576	-	-	-	-	7 361	-	-	-	-
Ethiopia	13 705	-	-	-	-	44 650	100	-	-	-
Libyan Arab Jamahiriya	217	-	-	-	-	330	-	-	-	-
Mali[a]	13 072	-	-	-	-	16 532	-	-	-	-
Mauritania	317	-	-	-	-	3 110	-	-	-	-
Morocco	4 328	2	37	-	3	407	-	-	-	-
Niger	1 328	0	-	-	-	4 040	599	-	-	-
Somalia	7 515	-	-	-	-	-	-	-	-	-
Sudan	70 491	-	-	-	-	54 153	-	-	-	-
Tunisia	959	1	45	-	n.s.	177	n.s.	-	-	-
Western Sahara	1 011	-	-	-	-	-	-	-	-	-
Total Northern Africa	**135 958**									
Benin	2 675	-	-	-	-	3 836	-	-	-	-
Burundi	198	-	-	-	-	722	-	-	-	-
Cameroon	22 345	-	-	-	-	14 758	-	-	-	-
Cape Verde	82	-	-	-	-	-	-	-	-	-
Central African Republic	22 903	-	-	-	-	10 122	-	-	-	-
Congo	22 556	17	-	-	-	10 581	216	-	-	-
Côte d'Ivoire	10 328	21	-	-	-	2 662	-	-	-	-
Democratic Republic of the Congo	135 207	-	-	-	-	83 277	-	-	-	-

TABLE 15

Disturbances affecting forest and other wooded land 2000 *(1 000 ha)*

Country/area	Forest					Other wooded land				
	Total area	Area affected annually by:				Total area	Area affected annually by:			
		Fire	Insects	Diseases	Other		Fire	Insects	Diseases	Other
Equatorial Guinea	1 708	-	-	-	-	22	-	-	-	-
Gabon	21 826	-	-	-	-	-	-	-	-	-
Gambia	461	150	-	100	-	140	-	-	-	-
Ghana	6 094	-	-	-	-	0	-	-	-	-
Guinea	6 904	-	-	-	-	5 850	-	-	-	-
Guinea-Bissau	2 120	30	-	-	-	241	-	-	-	-
Liberia	3 455	-	-	-	-	0	-	-	-	-
Nigeria	13 137	-	-	-	-	6 902	-	-	-	-
Rwanda	344	4	-	-	-	61	-	-	-	-
Saint Helena	2	-	-	-	-	0	-	-	-	-
Sao Tome and Principe	27	-	-	-	-	29	-	-	-	-
Senegal	8 898	97	-	-	-	5 101	145	-	-	-
Sierra Leone	2 851	200	-	-	-	511	-	-	-	-
Togo	486	-	-	-	-	1 246	-	-	-	-
Total Western and Central Africa	**284 608**									
Total Africa	**655 613**									
China	177 001	51	6 191	883	820	97 683	-	-	-	-
Democratic People's Republic of Korea	6 821	46	-	-	-	-	-	-	-	-
Japan	24 876	2	0	0	27	-	-	-	-	-
Mongolia	10 665	418	2 798	-	-	3 034	-	-	-	-
Republic of Korea	6 300	7	340	-	-	-	-	-	-	-
Total East Asia	**225 663**									
Bangladesh	884	-	n.s.	n.s.	-	53	-	-	-	-
Bhutan	3 141	8	n.s.	n.s.	-	609	-	-	-	-
Brunei Darussalam	288	-	-	-	-	155	-	-	-	-
Cambodia	11 541	-	-	-	-	298	-	-	-	-
India	67 554	3 700	1 000	8 400	-	4 732	-	-	-	-
Indonesia	97 852	122	0	0	0	-	-	-	-	-
Lao People's Democratic Republic	16 532	100	-	-	-	4 053	-	-	-	-
Malaysia	21 591	1	-	-	-	-	-	-	-	-
Maldives	1	-	-	-	-	0	-	-	-	-
Myanmar	34 554	6 500	-	-	-	10 629	-	-	-	-
Nepal	3 900	400	-	n.s.	-	1 753	-	-	-	-
Pakistan	2 116	41	10	70	-	1 323	-	-	-	-
Philippines	7 949	6	n.s.	1	3	3 292	-	-	-	-
Singapore	2	0	0	0	0	0	0	0	0	0
Sri Lanka	2 082	n.s.	-	-	n.s.	0	-	-	-	n.s.
Thailand	14 814	150	-	-	-	-	-	-	-	-
Timor-Leste	854	-	-	-	-	-	-	-	-	-
Viet Nam	11 725	-	-	-	-	1 816	-	-	-	-
Total South and Southeast Asia	**297 380**									
Afghanistan	1 015	-	-	-	-	-	-	-	-	-
Armenia	305	n.s.	28	-	-	45	-	-	-	-
Azerbaijan	936	n.s.	6	6	-	54	-	-	-	-

TABLE 15

Disturbances affecting forest and other wooded land 2000 *(1 000 ha)*

Country/area	Forest					Other wooded land				
	Total area	Area affected annually by:				Total area	Area affected annually by:			
		Fire	Insects	Diseases	Other		Fire	Insects	Diseases	Other
Bahrain	n.s.	-	-	-	-	0	-	-	-	-
Cyprus	173	1	-	-	-	214	2	-	-	-
Georgia	2 760	n.s.	1	-	-	51	-	-	-	-
Iran (Islamic Republic of)	11 075	6	220	-	-	5 340	-	-	-	-
Iraq	818	-	-	-	-	1 033	-	-	-	-
Israel	164	2	23	n.s.	-	62	-	-	-	-
Jordan	83	1	0	0	1	54	0	0	0	0
Kazakhstan	3 365	180	-	-	-	14 765	-	-	-	-
Kuwait	5	-	-	-	-	0	-	-	-	-
Kyrgyzstan	858	n.s.	60	10	-	303	-	-	-	-
Lebanon	131	19	-	-	-	117	-	-	-	-
Occupied Palestinian Territory	9	-	-	-	-	-	-	-	-	-
Oman	2	-	-	-	-	1 303	-	45	20	240
Qatar	n.s.	-	-	-	-	n.s.	-	-	-	-
Saudi Arabia	2 728	n.s.	4	2	3	34 155	n.s.	30	15	20
Syrian Arab Republic	432	n.s.	-	-	-	35	-	-	-	-
Tajikistan	410	1	103	6	-	142	3	13	0	-
Turkey[a]	10 052	8	-	-	-	10 728	3	-	-	-
Turkmenistan	4 127	-	-	-	-	0	-	-	-	-
United Arab Emirates	310	0	0	0	0	4	0	0	0	0
Uzbekistan	3 212	n.s.	19	7	-	-	-	-	-	-
Yemen	549	-	-	-	-	1 406	-	-	-	-
Total Western and Central Asia	**43 519**									
Total Asia	**566 562**									
Albania	769	3	70	97	23	255	4	23	32	8
Andorra	16	-	-	-	-	-	-	-	-	-
Austria[a]	3 838	n.s.	13	25	22	117	-	-	-	-
Belarus[a]	7 848	6	51	193	1	915	-	-	-	-
Belgium	667	n.s.	20	25	40	27	0	-	-	-
Bosnia and Herzegovina	2 185	12	10	1	1	549	3	-	-	-
Bulgaria	3 375	14	186	36	23	105	5	-	-	-
Channel Islands	1	-	-	-	-	0	-	-	-	-
Croatia	2 129	6	12	9	4	338	11	-	-	-
Czech Republic	2 637	1	1	18	9	0	0	0	0	0
Denmark	486	n.s.	-	-	4	136	0	-	-	-
Estonia	2 243	1	1	3	13	94	-	-	-	-
Faeroe Islands	n.s.	-	-	-	-	-	-	-	-	-
Finland	22 475	n.s.	46	1 042	3 883	830	-	-	-	-
France[a]	15 351	22	-	-	230	1 814	-	-	-	-
Germany	11 076	0	-	-	-	-	-	-	-	-
Gibraltar	0	-	-	-	-	0	-	-	-	-
Greece	3 601	13	-	-	-	2 924	17	-	-	-
Holy See	0	-	-	-	-	0	-	-	-	-
Hungary	1 907	8	84	59	467	0	-	-	-	-
Iceland	38	0	0	0	0	104	0	0	0	0
Ireland	609	n.s.	-	-	2	41	-	-	-	-
Isle of Man	3	-	-	-	-	0	-	-	-	-

TABLE 15

Disturbances affecting forest and other wooded land 2000 *(1 000 ha)*

Country/area	Forest					Other wooded land				
	Total area	Area affected annually by:				Total area	Area affected annually by:			
		Fire	Insects	Diseases	Other		Fire	Insects	Diseases	Other
Italy	9 447	46	66	-	24	992	-	-	-	-
Latvia	2 885	n.s.	n.s.	n.s.	2	120	-	-	-	-
Liechtenstein[a]	7	0	n.s.	-	1	0	-	-	-	-
Lithuania	2 020	n.s.	31	14	76	83	-	-	-	-
Luxembourg	87	-	-	-	-	1	-	-	-	-
Malta	n.s.	n.s.	0	0	0	0	0	0	0	0
Monaco	0	-	-	-	-	0	-	-	-	-
Netherlands	360	n.s.	-	-	-	0	0	0	0	0
Norway	9 301	n.s.	19	-	140	2 699	n.s.	-	-	-
Poland	9 059	6	120	74	20	-	-	-	-	-
Portugal	3 583	125	189	189	90	84	-	-	-	-
Republic of Moldova	326	-	96	-	-	31	-	-	-	-
Romania	6 366	2	-	-	26	234	-	-	-	-
Russian Federation	809 268	1 268	4 953	957	508	72 706	-	-	-	-
San Marino	n.s.	-	-	-	-	0	-	-	-	-
Serbia and Montenegro[a]	2 649	8	30	-	1	812	-	-	-	-
Slovakia	1 921	0	8	7	17	-	-	-	-	-
Slovenia	1 239	n.s.	n.s.	n.s.	1	44	n.s.	-	-	-
Spain	16 436	45	217	189	1 775	11 016	76	4	4	35
Sweden	27 474	1	-	78	88	3 246	n.s.	-	-	-
Switzerland	1 199	n.s.	-	-	4	64	-	-	-	0
The former Yugoslav Republic of Macedonia	906	3	-	-	-	82	n.s.	-	-	-
Ukraine	9 510	4	129	119	45	41	-	-	-	-
United Kingdom	2 793	1	1	0	6	20	0	0	0	0
Total Europe	**998 091**									
Anguilla	6	-	-	-	-	-	-	-	-	-
Antigua and Barbuda	9	-	-	-	-	16	-	-	-	-
Aruba	n.s.	-	-	-	-	0	-	-	-	-
Bahamas	515	-	-	-	-	36	-	-	-	-
Barbados	2	-	-	-	-	-	-	-	-	-
Bermuda	1	-	-	-	-	0	-	-	-	-
British Virgin Islands	4	-	-	-	-	2	-	-	-	-
Cayman Islands	12	-	-	-	-	4	-	-	-	-
Cuba	2 435	9	-	-	-	264	-	-	-	-
Dominica	47	-	-	-	-	n.s.	-	-	-	-
Dominican Republic	1 376	-	-	-	-	678	-	-	-	-
Grenada	4	-	-	-	-	5	-	-	-	-
Guadeloupe	81	-	-	-	-	2	-	-	-	-
Haiti	109	-	-	-	-	-	-	-	-	-
Jamaica	341	0	0	0	0	189	0	0	0	0
Martinique	46	-	-	-	-	-	-	-	-	-
Montserrat	4	-	-	-	-	-	-	-	-	-
Netherlands Antilles	1	-	-	-	-	33	-	-	-	-
Puerto Rico	407	-	-	-	-	-	-	-	-	-
Saint Kitts and Nevis	5	-	-	-	-	6	-	-	-	-
Saint Lucia	17	-	-	-	-	5	-	-	-	-

TABLE 15

Disturbances affecting forest and other wooded land 2000 *(1 000 ha)*

Country/area	Forest					Other wooded land				
	Total area	Area affected annually by:				Total area	Area affected annually by:			
		Fire	Insects	Diseases	Other		Fire	Insects	Diseases	Other
Saint Vincent and the Grenadines	10	-	-	-	-	2	-	-	-	-
Trinidad and Tobago	228	4	-	-	-	72	-	-	-	-
Turks and Caicos Islands	34	-	-	-	-	-	-	-	-	-
United States Virgin Islands	10	-	-	-	-	-	-	-	-	-
Total Caribbean	**5 706**									
Belize	1 653	-	-	-	-	115	-	-	-	-
Costa Rica	2 376	6	-	-	-	10	-	-	-	-
El Salvador	324	1	-	-	-	201	-	-	-	-
Guatemala	4 208	68	1	n.s.	-	1 672	-	-	-	-
Honduras	5 430	55	1	-	-	559	-	-	-	-
Nicaragua	5 539	-	-	33	-	973	-	-	-	-
Panama	4 307	-	-	-	-	1 143	5	-	-	-
Total Central America	**23 837**									
Canada[a]	310 134	2 054	14 238	-	-	91 951	-	-	-	-
Greenland	n.s.	-	-	-	-	8	-	-	-	-
Mexico[a]	65 540	194	8	2	1	20 174	-	-	-	-
Saint Pierre and Miquelon	3	-	-	-	2	-	-	-	-	-
United States of America	302 294	2 085	5 086	17 380	-	-	-	-	-	-
Total North America	**677 971**									
Total North and Central America	**707 514**									
American Samoa	18	0	n.s.	0	3	-	-	-	-	-
Australia	164 645	-	-	-	-	421 590	-	-	-	-
Cook Islands	16	-	-	-	-	-	-	-	-	-
Fiji	1 000	-	-	-	-	-	-	-	-	-
French Polynesia	105	-	-	-	-	-	-	-	-	-
Guam	26	-	-	-	2	0	-	-	-	-
Kiribati	2	-	-	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	63	-	-	-	-	-	-	-	-	-
Nauru	0	-	-	-	-	0	-	-	-	-
New Caledonia	717	-	-	-	-	787	-	-	-	-
New Zealand	8 226	n.s.	-	-	7	2 557	3	-	-	-
Niue	15	-	-	-	-	-	-	-	-	-
Northern Mariana Islands	34	-	-	-	-	-	-	-	-	-
Palau	40	-	-	-	-	-	-	-	-	-
Papua New Guinea	30 132	-	-	-	-	4 474	-	-	-	-
Pitcairn	4	-	-	-	-	0	-	-	-	-
Samoa	171	-	-	-	-	22	-	-	-	-
Solomon Islands	2 371	-	-	-	-	-	-	-	-	-
Tokelau	0	-	-	-	-	0	-	-	-	-
Tonga	4	-	-	-	-	1	-	-	-	-
Tuvalu	1	-	-	-	-	0	-	-	-	-
Vanuatu	440	-	-	-	-	476	-	-	-	-
Wallis and Futuna Islands	5	-	-	-	-	1	-	-	-	-
Total Oceania	**208 034**									

TABLE 15

Disturbances affecting forest and other wooded land 2000 *(1 000 ha)*

Country/area	Forest					Other wooded land				
	Total area	Area affected annually by:				Total area	Area affected annually by:			
		Fire	Insects	Diseases	Other		Fire	Insects	Diseases	Other
Argentina	33 770	644	-	-	-	60 734	1 146	-	-	-
Bolivia	60 091	1 907	-	-	-	2 473	-	-	-	-
Brazil	493 213	68	30	20	-	-	-	-	-	-
Chile	15 834	28	531	810	-	13 806	12	-	-	-
Colombia	60 963	23	-	-	-	18 158	22	-	-	-
Ecuador	11 841	-	-	-	-	1 360	-	-	-	-
Falkland Islands	0	-	-	-	-	0	-	-	-	-
French Guiana	8 063	0	0	0	0	0	0	0	0	0
Guyana	15 104	-	-	-	-	3 580	-	-	-	-
Paraguay	19 368	-	-	-	-	-	-	-	-	-
Peru	69 213	35	-	-	-	22 132	-	-	-	-
South Georgia and the South Sandwich Islands	0	-	-	-	-	0	-	-	-	-
Suriname	14 776	n.s.	n.s.	n.s.	n.s.	-	-	-	-	-
Uruguay	1 409	1	-	-	-	4	-	-	-	-
Venezuela (Bolivarian Republic of)	49 151	14	-	-	-	7 421	-	-	-	-
Total South America	**852 796**									
WORLD	**3 988 610**									

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has assigned these values to the forest category.

TABLE 16
Composition of growing stock and diversity of tree species 2000

Country/area	Growing stock composition (% of total growing stock)		No. of native tree species	No. of tree species in IUCN red list[a]		
	3 most common species	10 most common species		Critically endangered	Endangered	Vulnerable
Angola	-	-	-	0	2	19
Botswana	-	-	-	0	0	0
British Indian Ocean Territory	-	-	-	-	-	-
Comoros	60.7	100	62	2	2	1
Kenya	-	-	-	3	14	50
Lesotho	-	-	60	0	0	1
Madagascar	11.6	23.1	5 000	34	65	63
Malawi	-	-	-	0	2	6
Mauritius	58.3	62.8	194	41	14	9
Mayotte	-	-	-	-	-	-
Mozambique	-	-	-	4	2	40
Namibia	47.7	81.5	200	2	2	7
Réunion	100	100	129	8	5	1
Seychelles	-	-	93	7	4	23
South Africa	-	-	649	1	13	40
Swaziland	-	-	-	2	2	7
Uganda	-	-	-	3[b]	4[b]	33[b]
United Republic of Tanzania	-	-	-	8[b]	35[b]	49[b]
Zambia	-	-	665	0	11	14
Zimbabwe	44.5	48.2	1 747	0[b]	2[b]	12[b]
Total Eastern and Southern Africa						
Algeria	55.2	65.6	20	0	1	1
Burkina Faso	-	-	90	0	0	3
Chad	-	-	109	0	0	2
Djibouti	-	-	-	0	1	1
Egypt	88.2	95.5	60	0	0	0
Eritrea	-	-	-	0	0	3
Ethiopia	-	-	1 027[c]	0	1	21
Libyan Arab Jamahiriya	-	-	12	0	0	1
Mali	-	-	1 739[c]	0	2	4
Mauritania	-	-	52	0	0	0
Morocco	69.1	90.1	47	1	0	0
Niger	-	-	227	0	0	2
Somalia	-	-	-	0	3	14
Sudan	23.1	31.2	533	1	1	15
Tunisia	83.2	100	20	0	0	0
Western Sahara	-	-	-	-	-	-
Total Northern Africa						
Benin	-	-	-	0[b]	0[b]	14[b]
Burundi	-	-	-	0	0	1
Cameroon	-	-	600	50[b]	27[b]	106[b]
Cape Verde	-	-	240	0	0	2
Central African Republic	-	-	-	0	1	8
Congo	9.8	18.1	334	-	-	-
Côte d'Ivoire	-	-	-	1	4	49
Democratic Republic of the Congo	-	-	870	0	8	43

TABLE 16
Composition of growing stock and diversity of tree species 2000

Country/area	Growing stock composition (% of total growing stock)		No. of native tree species	No. of tree species in IUCN red list[a]		
	3 most common species	10 most common species		Critically endangered	Endangered	Vulnerable
Equatorial Guinea	-	-	-	1	4	11
Gabon	-	-	-	3	6	59
Gambia	43.8	71.4	140	0	0	0
Ghana	12.3	21.8	680	3	19	94
Guinea	-	-	-	0	0	21
Guinea-Bissau	25.3	47.8	2 243	0	0	4
Liberia	-	-	-	0[c]	4[c]	42[c]
Nigeria	-	-	560	16b	18[b]	138[b]
Rwanda	-	-	300	0	0	3
Saint Helena	-	-	-	-	-	-
Sao Tome and Principe	-	-	-	0	1	26
Senegal	29.2	54.8	315	0	0	4
Sierra Leone	-	-	213	0	4	42
Togo	-	-	1 451	0	0	10
Total Western and Central Africa						
Total Africa						
China	29.0	64.0	2 500	34	45	96
Democratic People's Republic of Korea	-	-	-	0	0	1
Japan	54.7	67.6	1 327	67[d]	43[d]	87[d]
Mongolia	93.4	100	-	0	0	0
Republic of Korea	52.2	85.5	1 049	0	0	0
Total East Asia						
Bangladesh	-	-	1 074	4	2	6
Bhutan	44.4	63.5	105	1	2	4
Brunei Darussalam	-	-	2 000	37	24	31
Cambodia	-	-	862	10	13	9
India	21.9	27.2	-	50[b]	98[b]	98[b]
Indonesia	19.9	26.8	-	122	57	76
Lao People's Democratic Republic	30.4	39.3	1 457[e]	5[b]	7[b]	8[b]
Malaysia	29.6	63.3	2 650	50[b]	99[b]	403[b]
Maldives	-	-	-	-	-	-
Myanmar	11.2	19.5	2 000	13	12	12
Nepal	45.1	68.7	225[f]	0	0	3
Pakistan	67.3	87.2	1 104	0	0	2
Philippines	28.8	53.0	3 000	46[b]	35[b]	134[b]
Singapore	-	-	2 013[b,c]	11[b]	11[b]	27[b]
Sri Lanka	-	-	932	78[b]	73[b]	129[b]
Thailand	-	-	-	30[b]	21[b]	37[b]
Timor-Leste	-	-	251	-	-	-
Viet Nam	7.2	18.5	800	25[b]	36[b]	85[b]
Total South and Southeast Asia						
Afghanistan	-	-	-	0	0	1
Armenia	93.9	98.7	125	0	0	0
Azerbaijan	-	-	109	0	0	0

TABLE 16
Composition of growing stock and diversity of tree species 2000

Country/area	Growing stock composition (% of total growing stock)		No. of native tree species	No. of tree species in IUCN red list[a]		
	3 most common species	10 most common species		Critically endangered	Endangered	Vulnerable
Bahrain	-	-	-	-	-	-
Cyprus	-	-	36	0	0	1
Georgia	76.4	98.2	153	0	0	0
Iran (Islamic Republic of)	69.9	96.2	503	0	0	1
Iraq	-	-	20	0	0	0
Israel	-	-	70	0	0	0
Jordan	-	-	25	0	0	0
Kazakhstan	67.0	99.3	-	0	0	1
Kuwait	-	-	-	-	-	-
Kyrgyzstan	76.3	91.0	-	0	0	1
Lebanon	76.8	98.8	41	0	0	0
Occupied Palestinian Territory	-	-	-	-	-	-
Oman	-	-	155[c]	0[c]	1[c]	5[c]
Qatar	-	-	-	-	-	-
Saudi Arabia	60.4	90.2	52	0	2	1
Syrian Arab Republic	-	-	-	0	0	0
Tajikistan	76.2	90.2	268	1	0	0
Turkey	79.7	97.3	116	0	0	2
Turkmenistan	77.1	79.7	47	0	0	0
United Arab Emirates	-	-	-	0	0	0
Uzbekistan	88.6	91.3	75	0	0	1
Yemen	-	-	534[c]	-	-	-
Total Western and Central Asia						
Total Asia						
Albania	-	-	280[c]	0	0	0
Andorra	-	-	-	-	-	-
Austria	77.8	96.0	51	0	0	0
Belarus	85.0	99.8	28	0	0	0
Belgium	63.9	88.8	58	0	0	0
Bosnia and Herzegovina	82.1	91.9	97	0	0	1
Bulgaria	61.1	93.4	128	0	0	0
Channel Islands	-	-	-	-	-	-
Croatia	60.3	85.4	59	0	0	0
Czech Republic	84.5	97.2	70	0	0	1
Denmark	63.8	91.1	38	0	0	0
Estonia	75.2	99.2	27	0	0	0
Faeroe Islands	-	-	-	-	-	-
Finland	92.9	99.9	32	0	0	0
France	44.4	80.8	73	0	0	0
Germany	74.5	90.1	62	2	1	5
Gibraltar	-	-	-	-	-	-
Greece	-	-	-	0	0	0
Holy See	-	-	-	-	-	-
Hungary	39.5	87.1	47	1	2	3
Iceland	87.4	95.4	3	0	0	0
Ireland	-	-	25	0	0	1
Isle of Man	-	-	-	-	-	-

TABLE 16
Composition of growing stock and diversity of tree species 2000

Country/area	Growing stock composition (% of total growing stock)		No. of native tree species	No. of tree species in IUCN red list[a]		
	3 most common species	10 most common species		Critically endangered	Endangered	Vulnerable
Italy	34.4	66.6	117	2	0	0
Latvia	86.5	99.8	26	0	0	0
Liechtenstein	-	-	39	0	0	0
Lithuania	82.6	99.7	24	0	0	0
Luxembourg	86.9	98.6	-	0	0	0
Malta	-	-	3	0	0	0
Monaco	-	-	-	-	-	-
Netherlands	55.1	91.3	28[c]	0	0	0
Norway	91.3	98.5	32	0	0	0
Poland	-	-	57	0	0	1
Portugal	-	-	51	1	3	2
Republic of Moldova	-	-	35	0	0	0
Romania	73.2	86.8	58	0	0	1
Russian Federation	65.6	99.1	181[f]	4	8	7
San Marino	-	-	-	-	-	-
Serbia and Montenegro	50.4	65.4	48	0	0	0
Slovakia	76.8	97.8	59	0	0	1
Slovenia	71.7	92.2	73	0	0	0
Spain	40.1	81.6	123[f]	2	1	6
Sweden	91.4	99.0	32	0	0	1
Switzerland	78.9	95.4	52	0	0	0
The former Yugoslav Republic of Macedonia	-	-	-	0	0	0
Ukraine	71.5	97.7	85	0	0	1
United Kingdom	52.4	84.1	66	3	1	6
Total Europe						
Anguilla	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	0	3	1
Aruba	-	-	-	-	-	-
Bahamas	-	-	-	0	3	2
Barbados	-	-	-	0	1	1
Bermuda	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-
Cuba	-	-	625	23	50	50
Dominica	-	-	-	0	4	5
Dominican Republic	-	-	-	2[b]	8[b]	20[b]
Grenada	-	-	-	0	2	1
Guadeloupe	-	-	355	0	4	4
Haiti	-	-	76	5	6	17
Jamaica	-	-	722	15	27	62
Martinique	-	-	-	0	4	5
Montserrat	-	-	-	0	2	2
Netherlands Antilles	-	-	-	0	2	0
Puerto Rico	-	-	-	22[b]	16[b]	16[b]
Saint Kitts and Nevis	-	-	-	0	1	1
Saint Lucia	-	-	-	0	2	4

TABLE 16
Composition of growing stock and diversity of tree species 2000

Country/area	Growing stock composition (% of total growing stock)		No. of native tree species	No. of tree species in IUCN red list[a]		
	3 most common species	10 most common species		Critically endangered	Endangered	Vulnerable
Saint Vincent and the Grenadines	-	-	-	0	2	3
Trinidad and Tobago	33.2	62.8	267	-	1	-
Turks and Caicos Islands	-	-	-	0	0	2
United States Virgin Islands	39.3	75.9	-	2	4	1
Total Caribbean						
Belize	-	-	4 000	0[b]	11[b]	18[b]
Costa Rica	-	-	117[f]	4[b]	33[b]	74[b]
El Salvador	-	-	-	1	6	19
Guatemala	-	-	700	2	30	51
Honduras	-	-	400	43[b]	38[b]	30[b]
Nicaragua	-	-	1 000	3	16	20
Panama	10.5	21.7	1 415	19[b]	71[b]	106[b]
Total Central America						
Canada	32.6	70.3	180	0	0	0
Greenland	-	-	-	-	-	-
Mexico	-	-	1 130	0	7	23
Saint Pierre and Miquelon	-	-	21	0	0	0
United States of America	25.2	48.3	1 051	55	69	60
Total North America						
Total North and Central America						
American Samoa	38.2	72.4	-	0	0	1
Australia	-	-	2 100	2	8	27
Cook Islands	-	-	-	0	0	1
Fiji	-	-	-	-	-	-
French Polynesia	-	-	-	26[b]	4[b]	17[b]
Guam	44.1	81.3	-	1	0	2
Kiribati	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	0	0	4
Nauru	-	-	-	-	-	-
New Caledonia	-	-	-	12	18	37
New Zealand	-	-	121	1	2	4
Niue	-	-	-	0	0	1
Northern Mariana Islands	-	-	-	2	0	2
Palau	-	-	-	0	0	3
Papua New Guinea	-	-	-	-	-	-
Pitcairn	-	-	-	-	-	-
Samoa	-	-	-	-	-	-
Solomon Islands	-	-	-	0	1	14
Tokelau	-	-	-	-	-	-
Tonga	-	-	-	1	0	2
Tuvalu	-	-	-	-	-	-
Vanuatu	-	-	-	1	2	5
Wallis and Futuna Islands	-	-	292[b]	0	0	0
Total Oceania						

TABLE 16
Composition of growing stock and diversity of tree species 2000

Country/area	Growing stock composition (% of total growing stock)		No. of native tree species	No. of tree species in IUCN red list[a]		
	3 most common species	10 most common species		Critically endangered	Endangered	Vulnerable
Argentina	50.5	63.6	236	0	10	34
Bolivia	27.6	48.8	2 700	4[b]	9[b]	57[b]
Brazil	-	-	7 880	34	100	187
Chile	40.5	78.6	123	0	6	23
Colombia	-	-	5 000[f,g]	31[b]	50[b]	108[b]
Ecuador	-	-	1 000[g]	240[b]	669[b]	923[b]
Falkland Islands	-	-	-	-	-	-
French Guiana	30.9	48.4	1 200	3	2	11
Guyana	-	-	1 182	1	3	18
Paraguay	-	-	-	0[b]	5[b]	7[b]
Peru	-	-	2 500	33	14	54
South Georgia and the South Sandwich Islands	-	-	-	-	-	-
Suriname	-	-	600	1	2	24
Uruguay	-	-	147	0	0	0
Venezuela (Bolivarian Republic of)	-	-	1 360	3[b]	6[b]	50[b]
Total South America						
WORLD						

[a] IUCN (2004).

[b] Includes all plant species.

[c] Includes shrubs.

[d] Includes bamboo and palm species.

[e] Refers to the number of endemic plants in the country.

[f] Limited to inventoried tree species.

[g] An approximate estimate of at least this amount.

TABLE 17

Removals of wood products 1990–2005 *(1 000 m³ o.b.)*

Country/area	1990 Total	2000 Total	2005			% of growing stock 2005
			Total	Industrial roundwood	Fuelwood	
Angola	3 668	4 905	5 196	1 283	3 913	0.2
Botswana	792	851	881	132	749	0.4
British Indian Ocean Territory	-	-	-	-	-	-
Comoros	168	193	206	9	197	15.3
Kenya	21 385	24 900	26 658	2 402	24 256	9.5
Lesotho	1 771	2 227	2 455	-	2 455	-
Madagascar	7 246	9 973	7 031	598	6 433	0.3
Malawi[a]	6 348	6 297	6 272	655	5 617	1.7
Mauritius	27	18	14	8	6	0.5
Mayotte	-	-	-	-	-	-
Mozambique	18 174	20 744	22 029	1 732	20 297	4.4
Namibia[a]	-	-	-	-	-	-
Réunion	-	-	8	6	2	-
Seychelles	10	12	13	10	3	0.4
South Africa	15 521	17 000	17 741	17 491	250	2.8
Swaziland	1 814	1 024	1 024	380	644	5.3
Uganda	35 909	42 936	46 449	4 408	42 041	29.8
United Republic of Tanzania	23 846	26 637	28 033	2 833	25 200	2.2
Zambia	8 073	9 259	9 851	1 053	8 798	0.8
Zimbabwe	8 552	10 519	11 566	1 185	10 381	1.9
Total Eastern and Southern Africa						
Algeria[a]	165	184	195	150	45	0.1
Burkina Faso[a]	6 339	7 248	7 338	5	7 333	3.1
Chad	3 931	4 168	4 292	204	4 088	2.0
Djibouti	-	-	-	-	-	-
Egypt	-	-	240	120	120	3.0
Eritrea	-	2 551	2 551	2	2 549	-
Ethiopia	85 841	103 188	111 861	2 982	108 879	39.3
Libyan Arab Jamahiriya	-	-	-	-	-	-
Mali	4 961	5 911	6 386	507	5 879	3.3
Mauritania	1 097	1 651	-	-	-	-
Morocco	1 012	897	949	491	458	0.5
Niger[a]	9 544	12 151	12 473	594	11 879	95.9
Somalia	7 437	10 703	12 334	132	12 202	7.9
Sudan	20 684	21 715	22 230	2 716	19 514	2.4
Tunisia	208	236	274	223	51	1.0
Western Sahara	14	23	23	12	10	0.1
Total Northern Africa						
Benin	-	-	-	-	-	-
Burundi	6 721	8 217	9 693	383	9 310	-
Cameroon	14 861	17 989	19 772	3 211	16 561	1.5
Cape Verde	-	-	-	-	-	-
Central African Republic	4 054	3 566	3 566	1 108	2 458	0.1
Congo	2 059	2 424	2 767	1 450	1 317	0.1
Côte d'Ivoire	8 826	12 137	12 545	2 175	10 370	0.5
Democratic Republic of the Congo	54 922	78 791	82 994	4 199	78 795	0.3

TABLE 17

Removals of wood products 1990–2005 *(1 000 m³ o.b.)*

Country/area	1990 Total	2000 Total	2005			% of growing stock 2005
			Total	Industrial roundwood	Fuelwood	
Equatorial Guinea	714	933	933	419	514	0.9
Gabon	2 198	3 550	4 227	3 600	627	0.1
Gambia	602	783	873	154	718	5.0
Ghana	16 078	24 999	29 458	1 205	28 253	9.2
Guinea	11 412	13 179	14 001	748	13 253	2.7
Guinea-Bissau	1 110	1 309	1 417	32	1 385	2.8
Liberia	5 048	5 610	5 918	-	5 918	1.2
Nigeria	63 756	79 002	86 627	13 916	72 711	6.3
Rwanda	3 114	7 789	10 429	226	10 203	11.9
Saint Helena	-	-	-	-	-	-
Sao Tome and Principe	10	10	10	10	-	0.2
Senegal	4 696	5 131	5 110	10	5 100	1.6
Sierra Leone	5 534	6 212	6 551	137	6 414	-
Togo	-	7 054	6 332	3 320	3 012	-
Total Western and Central Africa						
Total Africa						
China	159 081	144 775	135 435	88 808	46 628	1.0
Democratic People's Republic of Korea	5 745	8 043	8 692	1 725	6 967	2.2
Japan	31 130	18 843	22 334	22 334	-	0.5
Mongolia	1 084	448	448	37	411	n.s.
Republic of Korea	3 911	4 019	4 074	1 754	2 320	0.8
Total East Asia						
Bangladesh	802	1 114	1 269	253	1 016	4.2
Bhutan	313	290	277	207	70	n.s.
Brunei Darussalam	100	100	100	100	n.s.	0.2
Cambodia	3 250	3 192	-	-	-	-
India	9 001	5 735	4 724	1 252	3 472	0.1
Indonesia	26 560	24 409	11 257	11 178	79	0.2
Lao People's Democratic Republic	6 965	7 424	7 424	682	6 742	0.8
Malaysia	53 739	28 289	24 014	20 600	3 414	0.5
Maldives	-	-	-	-	-	-
Myanmar	39 084	40 708	43 060	3 880	39 180	1.6
Nepal	138	110	119	67	52	n.s.
Pakistan	27 174	31 660	33 904	2 301	31 603	18.3
Philippines	2 721	759	541	403	138	n.s.
Singapore	-	-	-	-	-	-
Sri Lanka	9 355	7 546	6 642	763	5 879	15.9
Thailand	710	54	49	41	8	n.s.
Timor-Leste	-	-	-	-	-	-
Viet Nam	35 505	27 219	23 735	2 500	21 235	2.8
Total South and Southeast Asia						
Afghanistan	2 391	1 033	863	170	693	6.4
Armenia	-	79	91	11	80	0.3
Azerbaijan	-	15	16	8	7	n.s.

TABLE 17

Removals of wood products 1990–2005 *(1 000 m³ o.b.)*

Country/area	1990 Total	2000 Total	2005			% of growing stock 2005
			Total	Industrial roundwood	Fuelwood	
Bahrain	-	-	-	-	-	-
Cyprus	56	28	13	9	4	0.2
Georgia	351	389	619	140	478	0.1
Iran (Islamic Republic of)	1 681	2 105	2 468	2 448	20	0.5
Iraq	0	9	0	0	0	-
Israel	61	65	20	20	-	-
Jordan[a]	6	10	12	3	9	0.5
Kazakhstan	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	45	37	13	25	0.1
Lebanon	0	0	0	0	-	-
Occupied Palestinian Territory	-	-	-	-	-	-
Oman	-	-	-	-	-	-
Qatar	-	-	-	-	-	-
Saudi Arabia	35	46	0	0	0	0
Syrian Arab Republic	6	5	-	-	-	-
Tajikistan	6	6	6	0	6	0.1
Turkey	36 104	32 024	29 983	11 836	18 147	2.1
Turkmenistan	10	10	10	0	10	0.1
United Arab Emirates	0	0	0	0	0	0
Uzbekistan	49	29	30	9	21	0.1
Yemen	-	-	-	-	-	-
Total Western and Central Asia						
Total Asia						
Albania	626	157	168	24	144	0.2
Andorra	-	-	-	-	-	-
Austria[a]	17 318	16 834	20 127	15 858	4 269	1.7
Belarus	-	7 367	8 568	7 323	1 245	0.6
Belgium	4 352	3 526	4 368	3 768	600	2.5
Bosnia and Herzegovina	4 773	4 326	4 139	2 993	1 146	1.1
Bulgaria	3 400	3 778	4 200	3 075	1 125	0.7
Channel Islands	-	-	-	-	-	-
Croatia	2 287	4 062	4 950	3 662	1 288	1.4
Czech Republic	13 030	15 860	17 274	16 317	957	2.3
Denmark	2 023	2 099	1 807	900	907	2.4
Estonia	3 206	11 164	9 602	7 502	2 100	2.1
Faeroe Islands	-	-	-	-	-	-
Finland	47 203	60 603	64 295	59 095	5 200	3.0
France	55 621	58 330	51 475	33 443	18 032	2.1
Germany	42 177	48 818	60 770	54 497	6 273	-
Gibraltar	-	-	-	-	-	-
Greece	2 979	2 221	1 842	438	1 404	1.0
Holy See	-	-	-	-	-	-
Hungary	5 945	5 902	5 528	3 421	2 107	1.6
Iceland	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Ireland	1 789	2 778	2 819	2 797	22	4.3
Isle of Man	-	-	-	-	-	-

TABLE 17

Removals of wood products 1990–2005 *(1 000 m³ o.b.)*

Country/area	1990 Total	2000 Total	2005			% of growing stock 2005
			Total	Industrial roundwood	Fuelwood	
Italy	9 877	10 031	9 600	3 800	5 800	0.7
Latvia	4 820	11 574	11 500	10 580	920	1.9
Liechtenstein	21	21	21	16	5	1.2
Lithuania	3 651	6 171	7 727	5 881	1 846	1.9
Luxembourg	-	230	139	135	4	0.5
Malta	0	0	0	0	0	0
Monaco	-	-	-	-	-	-
Netherlands	1 518	1 147	1 200	860	340	1.8
Norway	12 475	10 304	9 219	7 631	1 588	1.1
Poland	23 617	29 882	33 015	31 692	1 323	1.8
Portugal	11 922	10 590	11 123	10 433	690	3.2
Republic of Moldova	-	62	65	31	34	0.1
Romania	17 218	14 285	17 300	11 418	5 882	1.3
Russian Federation	336 527	152 316	180 000	129 400	50 600	0.2
San Marino	-	-	-	-	-	-
Serbia and Montenegro	3 806	3 002	2 600	1 301	1 299	0.8
Slovakia	5 545	6 150	6 732	6 372	360	1.4
Slovenia	2 978	2 547	3 153	2 622	531	0.9
Spain	18 517	17 965	17 689	15 741	1 948	2.0
Sweden	58 140	70 570	76 780	68 740	8 040	2.4
Switzerland	5 345	6 421	6 958	5 664	1 294	1.5
The former Yugoslav Republic of Macedonia	-	927	927	162	765	1.5
Ukraine	13 590	12 231	14 820	6 660	8 160	0.7
United Kingdom	7 152	8 471	8 895	8 630	265	2.6
Total Europe						
Anguilla	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-	-
Aruba	-	-	-	-	-	-
Bahamas	132	20	20	20	-	0.3
Barbados	0	6	6	6	-	-
Bermuda	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-
Cuba	3 089	2 433	2 195	833	1 362	0.9
Dominica	-	-	-	-	-	-
Dominican Republic	646	646	646	7	639	1.0
Grenada	-	-	-	-	-	-
Guadeloupe	21	18	18	n.s.	17	-
Haiti	2 165	2 532	2 550	275	2 275	37.2
Jamaica[a]	-	1	1	1	-	n.s.
Martinique	14 191	13 800	13 800	2 300	11 500	-
Montserrat	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-
Puerto Rico	-	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-	-
Saint Lucia	-	-	-	-	-	-

TABLE 17
Removals of wood products 1990–2005 *(1 000 m³ o.b.)*

Country/area	1990 Total	2000 Total	2005			% of growing stock 2005
			Total	Industrial roundwood	Fuelwood	
Saint Vincent and the Grenadines	-	-	-	-	-	-
Trinidad and Tobago	60	67	75	75	-	0.4
Turks and Caicos Islands	-	-	-	-	-	-
United States Virgin Islands	-	-	-	-	-	-
Total Caribbean						
Belize	216	216	216	71	145	0.1
Costa Rica	1 198	2 398	2 400	1 932	468	1.0
El Salvador	4 275	5 957	5 201	682	4 519	-
Guatemala	13 143	17 211	19 245	623	18 622	3.0
Honduras	10 916	14 022	15 576	1 009	14 567	2.9
Nicaragua	1 908	1 454	1 846	106	1 740	0.3
Panama	813	573	464	53	410	0.1
Total Central America						
Canada[a]	195 869	214 788	223 500	219 500	4 000	0.7
Greenland	-	-	-	-	-	-
Mexico	9 399	8 740	8 351	7 667	684	-
Saint Pierre and Miquelon	-	-	n.s.	0	n.s.	-
United States of America	596 920	548 065	540 838	489 586	51 252	1.5
Total North America						
Total North and Central America						
American Samoa	-	-	-	-	-	-
Australia	20 331	28 200	29 826	26 734	3 092	-
Cook Islands	0	6	6	6	-	-
Fiji	291	250	254	253	1	-
French Polynesia	-	-	-	-	-	-
Guam	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-	-
Nauru	-	-	-	-	-	-
New Caledonia	11	6	6	6	-	n.s.
New Zealand	13 841	21 280	24 687	24 687	-	-
Niue	0	6	6	6	-	-
Northern Mariana Islands	-	-	-	-	-	-
Palau	-	-	-	-	-	-
Papua New Guinea	8 795	8 347	8 364	2 001	6 363	0.8
Pitcairn	-	-	-	-	-	-
Samoa	8	15	11	11	-	-
Solomon Islands	529	920	796	637	159	-
Tokelau	-	-	-	-	-	-
Tonga	5	3	2	2	-	-
Tuvalu	-	-	-	-	-	-
Vanuatu	73	135	152	47	105	-
Wallis and Futuna Islands	-	-	-	-	-	-
Total Oceania						

TABLE 17

Removals of wood products 1990–2005 *(1 000 m³ o.b.)*

Country/area	1990 Total	2000 Total	2005			% of growing stock 2005
			Total	Industrial roundwood	Fuelwood	
Argentina	10 954	11 002	11 026	7 536	3 490	06
Bolivia	-	609	620	582	38	n.s.
Brazil	368 706	293 219	290 476	168 091	122 385	0.4
Chile	26 092	41 276	48 867	32 964	15 903	2.6
Colombia	11 819	10 809	10 275	3 246	7 029	-
Ecuador	7 250	7 976	8 339	1 360	6 979	-
Falkland Islands	-	-	-	-	-	-
French Guiana	91	52	70	70	-	n.s.
Guyana	-	412	-	-	-	-
Paraguay	9 528	11 058	11 823	4 976	6 847	-
Peru	7 676	9 752	10 789	1 891	8 898	-
South Georgia and the South Sandwich Islands	-	-	-	-	-	-
Suriname	116	176	205	200	5	n.s.
Uruguay	2 897	3 333	4 900	3 160	1 740	4.1
Venezuela (Bolivarian Republic of)	664	1 138	813	812	2	-
Total South America						
WORLD						

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has assigned these values to the forest category.

TABLE 18
Removals of non-wood forest products 2005

Country/area	Plant products							
	Food *(tonnes)*	Fodder *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Raw material for utensils, crafts & construction *(tonnes)*	Ornamental plants *(tonnes)*	Exudates *(tonnes)*	Other plant products *(tonnes)*
Angola	-	-	-	-	-	-	-	-
Botswana	-	-	-	-	-	-	-	-
British Indian Ocean Territory	-	-	-	-	-	-	-	-
Comoros	151	-	-	-	-	14	-	-
Kenya	-	-	-	-	-	-	-	-
Lesotho	-	-	-	-	-	-	-	-
Madagascar	-	-	-	-	-	-	-	-
Malawi	-	-	-	-	-	-	-	-
Mauritius	11 000	308 000	-	-	96	-	-	160
Mayotte	-	-	-	-	-	-	-	-
Mozambique	-	-	-	-	-	-	-	-
Namibia	-	-	-	-	-	-	-	-
Réunion	-	-	-	-	-	-	-	-
Seychelles	-	-	-	444	-	-	-	-
South Africa	-	-	-	-	-	-	-	-
Swaziland	-	-	-	-	-	-	-	-
Uganda	-	-	-	-	-	-	-	-
United Republic of Tanzania	-	-	-	-	-	-	-	-
Zambia	-	-	-	-	-	-	-	-
Zimbabwe	-	-	-	-	-	-	-	-
Total Eastern and Southern Africa								
Algeria	-	-	-	-	-	-	-	-
Burkina Faso	-	-	-	-	-	-	-	-
Chad	-	-	-	-	-	-	-	-
Djibouti	-	-	-	-	-	-	-	-
Egypt	50 000	10 200	-	-	-	-	-	-
Eritrea	-	-	-	-	-	-	-	-
Ethiopia	-	-	-	-	-	-	6 557	-
Libyan Arab Jamahiriya	-	-	-	-	-	-	-	-
Mali	-	-	-	-	-	-	-	-
Mauritania	-	-	-	-	-	-	-	-
Morocco	-	-	-	-	-	-	-	-
Niger	-	-	-	-	4 079	-	5 000	-
Somalia	-	-	-	-	-	-	-	-
Sudan	-	-	-	-	-	-	-	-
Tunisia	-	420 000	20 000	-	-	-	-	11 015
Western Sahara	-	-	-	-	-	-	-	-
Total Northern Africa								
Benin	-	-	-	-	-	-	-	-
Burundi	-	-	-	-	-	-	-	-
Cameroon	21 246	-	-	-	-	-	-	-
Cape Verde	-	-	-	-	-	-	-	-
Central African Republic	-	-	-	-	-	-	-	-
Congo	1 426	-	-	-	95 340	-	-	-

TABLE 18
Removals of non-wood forest products 2005

Animal products								Country/area
Living animals *(units)*	Hides, skins and trophies *(units)*	Wild honey and beeswax *(tonnes)*	Bushmeat *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Other edible animal products *(tonnes)*	Other non-edible animal products *(tonnes)*	
-	-	-	-	-	-	-	-	Angola
-	-	-	-	-	-	-	-	Botswana
-	-	-	-	-	-	-	-	British Indian Ocean Territory
-	-	6	-	-	-	-	-	Comoros
-	-	-	-	-	-	-	-	Kenya
-	-	-	-	-	-	-	-	Lesotho
-	-	-	-	-	-	-	-	Madagascar
-	-	-	-	-	-	-	-	Malawi
8 000	350	93	-	-	-	400	-	Mauritius
-	-	-	-	-	-	-	-	Mayotte
-	-	-	-	-	-	-	-	Mozambique
-	-	-	-	-	-	-	-	Namibia
-	-	-	-	-	-	-	-	Réunion
-	-	-	-	-	-	-	-	Seychelles
-	-	-	-	-	-	-	-	South Africa
-	-	-	-	-	-	-	-	Swaziland
-	-	-	-	-	-	-	-	Uganda
-	-	-	-	-	-	-	-	United Republic of Tanzania
-	-	-	-	-	-	-	-	Zambia
-	-	-	-	-	-	-	-	Zimbabwe
								Total Eastern and Southern Africa
-	-	2 000	-	-	-	-	-	Algeria
-	-	-	-	-	-	-	-	Burkina Faso
-	-	-	-	-	-	-	-	Chad
-	-	-	-	-	-	-	-	Djibouti
-	-	-	-	-	-	-	-	Egypt
-	-	-	-	-	-	-	-	Eritrea
-	-	-	-	-	-	-	-	Ethiopia
-	-	-	-	-	-	-	-	Libyan Arab Jamahiriya
-	-	-	-	-	-	-	-	Mali
-	-	-	-	-	-	-	-	Mauritania
-	-	-	-	-	-	-	-	Morocco
-	-	-	-	-	-	-	-	Niger
-	-	-	-	-	-	-	-	Somalia
663 712	1 388 515	-	664	-	-	-	-	Sudan
-	-	80	200	-	-	399	-	Tunisia
-	-	-	-	-	-	-	-	Western Sahara
								Total Northern Africa
-	-	-	-	-	-	-	-	Benin
-	-	-	-	-	-	-	-	Burundi
-	-	-	-	-	-	-	-	Cameroon
-	-	-	-	-	-	-	-	Cape Verde
-	-	-	-	-	-	-	-	Central African Republic
8 000	-	12 500	750	-	-	-	-	Congo

TABLE 18
Removals of non-wood forest products 2005

Country/area	Plant products							
	Food *(tonnes)*	Fodder *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Raw material for utensils, crafts & construction *(tonnes)*	Ornamental plants *(tonnes)*	Exudates *(tonnes)*	Other plant products *(tonnes)*
Côte d'Ivoire	-	-	-	-	-	-	-	-
Democratic Republic of the Congo	-	-	-	-	-	-	-	-
Equatorial Guinea	-	-	-	-	-	-	-	-
Gabon	-	-	-	-	-	-	-	-
Gambia	-	-	-	-	-	-	-	-
Ghana	-	-	-	-	-	-	-	-
Guinea	-	-	-	-	-	-	-	-
Guinea-Bissau	-	-	-	-	-	-	-	-
Liberia	-	-	-	-	-	-	-	-
Nigeria	-	-	-	-	-	-	-	-
Rwanda	-	-	-	-	-	-	-	-
Saint Helena	-	-	-	-	-	-	-	-
Sao Tome and Principe	-	-	-	-	-	-	-	-
Senegal	5 000	-	400	10	205	-	1 200	-
Sierra Leone	-	-	-	-	-	-	-	-
Togo	-	-	-	-	-	-	-	-
Total Western and Central Africa								
Total Africa								
China	3 174 800	-	11 000	-	-	-	1 131 100	49 200
Democratic People's Republic of Korea	-	-	-	-	-	-	-	-
Japan	4 615	-	-	-	44 394	-	-	-
Mongolia	-	-	-	-	-	-	-	-
Republic of Korea	231 199	-	1 233	-	-	-	-	-
Total East Asia								
Bangladesh	21 412	-	-	-	12 947	-	-	2 237
Bhutan	303	166 361	107	19	9 894	-	48	98
Brunei Darussalam	-	-	-	-	-	-	-	-
Cambodia	-	-	-	-	-	-	39 661	-
India	61 060	45 780	62 700	4 930	1 315 250	-	3 380	547 470
Indonesia	-	-	-	-	-	-	-	-
Lao People's Democratic Republic	-	-	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-	-	-
Maldives	-	-	-	-	-	-	-	-
Myanmar	-	-	0	3 000	1 496 000	-	0	-
Nepal	-	-	-	-	-	-	-	-
Pakistan	47 842	3 900 000	616	43 000	34 450	-	3 184	235
Philippines	-	-	-	-	-	-	-	-
Singapore	-	-	-	-	-	-	-	-
Sri Lanka	-	-	-	-	-	-	-	-
Thailand	-	-	-	-	-	-	-	-
Timor-Leste	-	-	-	-	-	-	-	-
Viet Nam	1 337	-	4 343	-	23	-	318 000	-
Total South and Southeast Asia								

TABLE 18
Removals of non-wood forest products 2005

Animal products								Country/area
Living animals *(units)*	Hides, skins and trophies *(units)*	Wild honey and beeswax *(tonnes)*	Bushmeat *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Other edible animal products *(tonnes)*	Other non-edible animal products *(tonnes)*	
-	-	-	-	-	-	-	-	Côte d'Ivoire
-	-	-	-	-	-	-	-	Democratic Republic of the Congo
-	-	-	-	-	-	-	-	Equatorial Guinea
-	-	-	-	-	-	-	-	Gabon
-	-	-	-	-	-	-	-	Gambia
-	-	-	-	-	-	-	-	Ghana
-	-	-	-	-	-	-	-	Guinea
-	-	-	-	-	-	-	-	Guinea-Bissau
-	-	-	-	-	-	-	-	Liberia
-	-	-	-	-	-	-	-	Nigeria
-	-	-	-	-	-	-	-	Rwanda
-	-	-	-	-	-	-	-	Saint Helena
-	-	-	-	-	-	-	-	Sao Tome and Principe
725 000	-	900	90	-	-	-	-	Senegal
-	-	-	-	-	-	-	-	Sierra Leone
-	-	-	-	-	-	-	-	Togo
								Total Western and Central Africa
								Total Africa
-	-	-	-	-	-	-	-	China
-	-	-	-	-	-	-	-	Democratic People's Republic of Korea
-	-	-	-	-	-	-	-	Japan
-	-	-	-	-	-	-	-	Mongolia
-	-	-	-	-	-	-	-	Republic of Korea
								Total East Asia
-	1 213	90	-	-	-	23 686	-	Bangladesh
0	1	-	-	-	-	-	-	Bhutan
-	-	-	-	-	-	-	-	Brunei Darussalam
-	-	-	-	-	-	-	-	Cambodia
-	-	-	-	-	-	-	-	India
-	-	-	-	-	-	-	-	Indonesia
-	-	-	-	-	-	-	-	Lao People's Democratic Republic
-	-	-	-	-	-	-	-	Malaysia
-	-	-	-	-	-	-	-	Maldives
-	-	-	-	-	-	-	1 000	Myanmar
-	-	-	-	-	-	-	-	Nepal
-	-	50	-	-	-	-	238	Pakistan
-	-	-	-	-	-	-	-	Philippines
-	-	-	-	-	-	-	-	Singapore
-	-	-	-	-	-	-	-	Sri Lanka
-	-	-	-	-	-	-	-	Thailand
-	-	-	-	-	-	-	-	Timor-Leste
-	-	56	-	-	-	-	-	Viet Nam
								Total South and Southeast Asia

TABLE 18
Removals of non-wood forest products 2005

Country/area	Plant products							
	Food *(tonnes)*	Fodder *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Raw material for utensils, crafts & construction *(tonnes)*	Ornamental plants *(tonnes)*	Exudates *(tonnes)*	Other plant products *(tonnes)*
Afghanistan	5 380	-	-	-	-	-	-	-
Armenia	-	-	-	-	-	-	-	-
Azerbaijan	-	-	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-	-	-
Cyprus	-	-	-	-	-	-	-	-
Georgia	-	-	-	-	-	-	-	-
Iran (Islamic Republic of)	1	-	7	-	-	-	85	-
Iraq	-	-	-	-	-	-	-	-
Israel	-	-	-	-	-	-	-	-
Jordan	-	-	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-	-	-
Kyrgyzstan	-	-	286	-	-	-	-	140
Lebanon	-	-	-	-	-	-	-	-
Occupied Palestinian Territory	-	-	-	-	-	-	-	-
Oman	-	-	-	-	-	-	-	-
Qatar	-	-	-	-	-	-	-	-
Saudi Arabia	-	-	-	-	-	-	-	-
Syrian Arab Republic	-	-	-	-	-	-	-	-
Tajikistan	413	-	5	0	0	0	0	0
Turkey	9 979	-	9 599	7	0	152	205	7 402
Turkmenistan	-	-	-	-	-	-	-	-
United Arab Emirates	0	0	0	0	0	0	0	0
Uzbekistan	4 650	11 000	285	55	-	-	-	-
Yemen	-	-	-	-	-	-	-	-
Total Western and Central Asia								
Total Asia								
Albania	72	-	2 208	358	711	-	-	-
Andorra	-	-	-	-	-	-	-	-
Austria	-	-	-	-	-	-	-	-
Belarus	15 000	23 000	400	300	-	-	-	3 300
Belgium	-	-	-	-	-	-	-	-
Bosnia and Herzegovina	-	-	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-	-	-
Channel Islands	-	-	-	-	-	-	-	-
Croatia	400	-	40	-	-	-	-	1 200
Czech Republic	40 960	0	2 800	0	0	-	0	0
Denmark	-	-	-	-	-	71 000	-	-
Estonia	-	-	-	-	-	2 000	-	-
Faeroe Islands	-	-	-	-	-	-	-	-
Finland	47 000	-	-	-	-	309	-	12 000
France	-	-	-	-	5 200	-	-	-
Germany	-	-	-	-	-	-	-	-
Gibraltar	-	-	-	-	-	-	-	-
Greece	-	-	-	-	-	-	-	-

TABLE 18
Removals of non-wood forest products 2005

Animal products								Country/area
Living animals *(units)*	Hides, skins and trophies *(units)*	Wild honey and beeswax *(tonnes)*	Bushmeat *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Other edible animal products *(tonnes)*	Other non-edible animal products *(tonnes)*	
-	-	-	-	-	-	-	-	Afghanistan
-	-	-	-	-	-	-	-	Armenia
-	-	-	-	-	-	-	-	Azerbaijan
-	-	-	-	-	-	-	-	Bahrain
-	-	811	-	-	-	-	-	Cyprus
-	-	-	-	-	-	-	-	Georgia
-	-	-	-	-	-	-	-	Iran (Islamic Republic of)
-	-	-	-	-	-	-	-	Iraq
-	-	-	-	-	-	-	-	Israel
-	-	-	-	-	-	-	-	Jordan
-	-	-	-	-	-	-	-	Kazakhstan
-	-	-	-	-	-	-	-	Kuwait
497	2 632	-	-	6	-	n.s.	-	Kyrgyzstan
-	-	-	-	-	-	-	-	Lebanon
-	-	-	-	-	-	-	-	Occupied Palestinian Territory
-	-	100	-	-	-	-	-	Oman
-	-	-	-	-	-	-	-	Qatar
-	-	60	-	-	-	-	-	Saudi Arabia
-	-	-	-	-	-	-	-	Syrian Arab Republic
0	0	0	0	0	0	0	0	Tajikistan
-	-	-	-	-	-	-	-	Turkey
-	-	-	-	-	-	-	-	Turkmenistan
0	0	0	0	0	0	0	0	United Arab Emirates
-	2 854	n.s.	2	-	-	-	n.s.	Uzbekistan
-	-	-	-	-	-	-	-	Yemen
								Total Western and Central Asia
								Total Asia
-	-	-	-	-	-	157	-	Albania
-	-	-	-	-	-	-	-	Andorra
-	-	-	-	-	-	-	-	Austria
260 000	5 500	-	3 200	-	-	-	-	Belarus
-	-	-	-	-	-	-	-	Belgium
-	-	-	-	-	-	-	-	Bosnia and Herzegovina
-	-	-	-	-	-	-	-	Bulgaria
-	-	-	-	-	-	-	-	Channel Islands
-	-	-	-	-	-	300	-	Croatia
500	216 570	0	9 578	0	0	0	0	Czech Republic
-	-	-	-	-	-	-	-	Denmark
-	37 500	-	913	-	-	-	-	Estonia
-	-	-	-	-	-	-	-	Faeroe Islands
-	355 000	-	9 279	-	-	2 260	-	Finland
-	-	6 300	-	-	-	-	-	France
-	-	-	34 000	-	-	-	-	Germany
-	-	-	-	-	-	-	-	Gibraltar
-	-	-	-	-	-	-	-	Greece

TABLE 18
Removals of non-wood forest products 2005

Country/area	Plant products							
	Food *(tonnes)*	Fodder *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Raw material for utensils, crafts & construction *(tonnes)*	Ornamental plants *(tonnes)*	Exudates *(tonnes)*	Other plant products *(tonnes)*
Holy See	-	-	-	-	-	-	-	-
Hungary	-	-	-	-	-	-	-	-
Iceland	-	0	-	-	-	92	0	0
Ireland	-	-	-	-	-	-	-	-
Isle of Man	-	-	-	-	-	-	-	-
Italy	79 155	2 306	-	-	9 703	-	-	-
Latvia	-	-	-	-	-	-	-	-
Liechtenstein	-	-	-	-	-	-	-	-
Lithuania	3 800	-	50	-	-	3 000	0	-
Luxembourg	-	-	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-
Monaco	-	-	-	-	-	-	-	-
Netherlands	-	-	-	-	-	6 000	-	-
Norway	19 000	-	-	-	-	5 517	-	-
Poland	15 088	-	-	-	-	843	-	1 000
Portugal	-	-	-	-	-	-	-	-
Republic of Moldova	-	-	-	-	-	150	-	-
Romania	-	0	-	0	-	-	0	-
Russian Federation	800	-	700	-	-	-	n.s.	500
San Marino	-	-	-	-	-	-	-	-
Serbia and Montenegro	-	-	-	-	-	0	-	-
Slovakia	1 155	140	160	-	10	255	-	-
Slovenia	550	-	-	-	-	1 200	-	-
Spain	12 018	-	-	-	0	-	959	70 050
Sweden	35 860	-	-	-	-	14	-	-
Switzerland	462	-	-	-	-	-	-	2
The former Yugoslav Republic of Macedonia	-	-	-	-	-	-	-	-
Ukraine	936	3 963	157	-	-	-	1 257	143 700
United Kingdom	162	-	15	14	-	162 545	-	13
Total Europe								
Anguilla	-	-	-	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-	-	-	-
Aruba	-	-	-	-	-	-	-	-
Bahamas	-	-	-	-	-	-	-	-
Barbados	-	-	-	-	-	-	-	-
Bermuda	-	-	-	-	-	-	-	-
British Virgin Islands	-	-	-	-	-	-	-	-
Cayman Islands	-	-	-	-	-	-	-	-
Cuba	-	-	1 474	68	-	-	-	-
Dominica	-	-	-	-	-	-	-	-
Dominican Republic	-	-	-	-	-	-	-	-
Grenada	-	-	-	-	-	-	-	-
Guadeloupe	-	-	-	-	-	-	-	-
Haiti	-	-	-	-	-	-	-	-

TABLE 18
Removals of non-wood forest products 2005

Animal products								Country/area
Living animals *(units)*	Hides, skins and trophies *(units)*	Wild honey and beeswax *(tonnes)*	Bushmeat *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Other edible animal products *(tonnes)*	Other non-edible animal products *(tonnes)*	
-	-	-	-	-	-	-	-	Holy See
-	-	-	-	-	-	-	-	Hungary
0	0	0	0	0	0	0	0	Iceland
-	-	-	-	-	-	-	-	Ireland
-	-	-	-	-	-	-	-	Isle of Man
-	-	-	-	-	-	-	-	Italy
-	37 800	-	1 500	-	-	-	-	Latvia
-	-	-	-	-	-	-	-	Liechtenstein
-	30 000	-	1 250	-	-	-	-	Lithuania
-	-	-	-	-	-	-	-	Luxembourg
-	-	-	-	-	-	-	-	Malta
-	-	-	-	-	-	-	-	Monaco
-	-	-	362	-	-	-	-	Netherlands
-	33 110	-	7 586	-	-	-	-	Norway
3 469	-	-	10 456	-	-	-	-	Poland
-	-	-	-	-	-	-	-	Portugal
-	-	-	-	-	-	-	-	Republic of Moldova
-	-	-	-	-	-	-	-	Romania
-	-	30	-	-	-	-	-	Russian Federation
-	-	-	-	-	-	-	-	San Marino
-	-	-	-	-	0	-	-	Serbia and Montenegro
10 200	22 470	-	1 688	-	-	-	-	Slovakia
-	20 000	2 300	1 000	-	-	-	-	Slovenia
-	3 040	39 114	21 723	-	-	-	-	Spain
-	177 200	-	16 790	-	-	-	-	Sweden
-	-	550	1 700	-	-	-	-	Switzerland
-	-	-	-	-	-	-	-	The former Yugoslav Republic of Macedonia
1 200	400 000	-	550	-	-	-	-	Ukraine
0	-	183	3 500	-	-	-	-	United Kingdom
								Total Europe
-	-	-	-	-	-	-	-	Anguilla
-	-	-	-	-	-	-	-	Antigua and Barbuda
-	-	-	-	-	-	-	-	Aruba
-	-	-	-	-	-	-	-	Bahamas
-	-	-	-	-	-	-	-	Barbados
-	-	-	-	-	-	-	-	Bermuda
-	-	-	-	-	-	-	-	British Virgin Islands
-	-	-	-	-	-	-	-	Cayman Islands
-	-	-	-	-	-	-	18 400	Cuba
-	-	-	-	-	-	-	-	Dominica
-	-	-	-	-	-	-	-	Dominican Republic
-	-	-	-	-	-	-	-	Grenada
-	-	-	-	-	-	-	-	Guadeloupe
-	-	-	-	-	-	-	-	Haiti

TABLE 18
Removals of non-wood forest products 2005

Country/area	Plant products							
	Food *(tonnes)*	Fodder *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Raw material for utensils, crafts & construction *(tonnes)*	Ornamental plants *(tonnes)*	Exudates *(tonnes)*	Other plant products *(tonnes)*
Jamaica	-	-	-	-	-	-	-	-
Martinique	-	-	-	-	-	-	-	-
Montserrat	-	-	-	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-	-	-	-
Puerto Rico	-	-	-	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-	-	-	-
Saint Lucia	-	-	-	-	-	-	-	-
Saint Vincent and the Grenadines	-	-	-	-	-	-	-	-
Trinidad and Tobago	-	-	-	-	-	-	-	60
Turks and Caicos Islands	-	-	-	-	-	-	-	-
United States Virgin Islands	-	-	-	-	-	-	-	-
Total Caribbean								
Belize	-	-	-	-	-	-	-	-
Costa Rica	-	-	-	-	-	-	-	-
El Salvador	-	-	-	-	-	-	-	-
Guatemala	-	-	-	-	-	-	-	-
Honduras	-	-	-	2	-	100	4 000	2
Nicaragua	-	-	-	-	-	-	-	-
Panama	-	-	-	-	-	-	-	-
Total Central America								
Canada	-	-	-	-	-	-	-	-
Greenland	-	-	-	-	-	-	-	-
Mexico	-	-	1 393	-	0	-	34 733	149 169
Saint Pierre and Miquelon	-	-	-	-	-	-	-	-
United States of America	6 443	-	-	-	-	-	-	-
Total North America								
Total North and Central America								
American Samoa	-	-	-	-	-	-	-	-
Australia	-	-	-	-	-	-	-	-
Cook Islands	-	-	38	-	-	-	-	-
Fiji	-	-	-	-	-	-	-	-
French Polynesia	-	-	-	-	-	-	-	-
Guam	-	-	-	-	-	-	-	-
Kiribati	-	-	-	-	-	-	-	-
Marshall Islands	-	-	-	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-	-	-	-
Nauru	-	-	-	-	-	-	-	-
New Caledonia	-	-	-	-	-	-	-	-
New Zealand	-	0	-	-	-	0	0	5 900
Niue	-	-	-	-	-	-	-	-
Northern Mariana Islands	-	-	-	-	-	-	-	-
Palau	-	-	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-	-	-
Pitcairn	-	-	-	-	-	-	-	-

TABLE 18
Removals of non-wood forest products 2005

Animal products								Country/area
Living animals *(units)*	Hides, skins and trophies *(units)*	Wild honey and beeswax *(tonnes)*	Bushmeat *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Other edible animal products *(tonnes)*	Other non-edible animal products *(tonnes)*	
-	-	-	-	-	-	-	-	Jamaica
-	-	-	-	-	-	-	-	Martinique
-	-	-	-	-	-	-	-	Montserrat
-	-	-	-	-	-	-	-	Netherlands Antilles
-	-	-	-	-	-	-	-	Puerto Rico
-	-	-	-	-	-	-	-	Saint Kitts and Nevis
-	-	-	-	-	-	-	-	Saint Lucia
-	-	-	-	-	-	-	-	Saint Vincent and the Grenadines
-	-	-	120	-	-	-	-	Trinidad and Tobago
-	-	-	-	-	-	-	-	Turks and Caicos Islands
-	-	-	-	-	-	-	-	United States Virgin Islands
								Total Caribbean
-	-	-	-	-	-	-	-	Belize
-	-	-	-	-	-	-	-	Costa Rica
-	-	-	-	-	-	-	-	El Salvador
-	-	-	-	-	-	-	-	Guatemala
-	-	-	-	-	-	-	-	Honduras
-	-	-	-	-	-	-	-	Nicaragua
-	-	-	-	-	-	-	-	Panama
								Total Central America
-	-	-	-	-	-	-	-	Canada
-	-	-	-	-	-	-	-	Greenland
-	-	-	-	-	-	-	-	Mexico
-	-	-	18	-	-	-	-	Saint Pierre and Miquelon
-	-	-	-	-	-	-	-	United States of America
								Total North America
								Total North and Central America
-	-	-	-	-	-	-	-	American Samoa
-	-	-	-	-	-	-	-	Australia
-	-	-	-	-	-	-	-	Cook Islands
-	-	-	-	-	-	-	-	Fiji
-	-	-	-	-	-	-	-	French Polynesia
-	-	-	-	-	-	-	-	Guam
-	-	-	-	-	-	-	-	Kiribati
-	-	-	-	-	-	-	-	Marshall Islands
-	-	-	-	-	-	-	-	Micronesia (Federated States of)
-	-	-	-	-	-	-	-	Nauru
-	-	-	-	-	-	-	-	New Caledonia
-	24 000	2 900	90	0	0	11	-	New Zealand
-	-	-	-	-	-	-	-	Niue
-	-	-	-	-	-	-	-	Northern Mariana Islands
-	-	-	-	-	-	-	-	Palau
-	-	-	-	-	-	-	-	Papua New Guinea
-	-	-	-	-	-	-	-	Pitcairn

TABLE 18
Removals of non-wood forest products 2005

Country/area	Plant products							
	Food *(tonnes)*	Fodder *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Raw material for utensils, crafts & construction *(tonnes)*	Ornamental plants *(tonnes)*	Exudates *(tonnes)*	Other plant products *(tonnes)*
Samoa	-	-	-	-	-	-	-	-
Solomon Islands	-	-	-	-	-	-	-	-
Tokelau	-	-	-	-	-	-	-	-
Tonga	-	-	-	-	-	-	-	-
Tuvalu	-	-	-	-	-	-	-	-
Vanuatu	-	-	-	-	-	-	-	-
Wallis and Futuna Islands	-	-	-	-	-	-	-	-
Total Oceania								
Argentina	-	-	-	-	-	-	14 850	61
Bolivia	-	-	-	-	-	-	-	-
Brazil	348 249	-	1 194	3 221	111 663	-	2 460	289 928
Chile	-	-	-	-	-	-	-	-
Colombia	-	-	-	-	-	-	-	-
Ecuador	-	-	-	-	-	-	-	-
Falkland Islands	-	-	-	-	-	-	-	-
French Guiana	-	-	-	-	-	-	-	-
Guyana	-	-	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-	-	-
Peru	10	-	296	10 074	155	-	5	1 977
South Georgia and the South Sandwich Islands	-	-	-	-	-	-	-	-
Suriname	-	-	-	-	-	-	-	-
Uruguay	-	-	-	-	-	-	-	-
Venezuela (Bolivarian Republic of)	-	-	-	-	-	-	-	-
Total South America								
WORLD								

TABLE 18
Removals of non-wood forest products 2005

Animal products								Country/area
Living animals *(units)*	Hides, skins and trophies *(units)*	Wild honey and beeswax *(tonnes)*	Bushmeat *(tonnes)*	Raw material for medicine and aromatic products *(tonnes)*	Raw material for colourants and dyes *(tonnes)*	Other edible animal products *(tonnes)*	Other non-edible animal products *(tonnes)*	
-	-	-	-	-	-	-	-	Samoa
-	-	-	-	-	-	-	-	Solomon Islands
-	-	-	-	-	-	-	-	Tokelau
-	-	-	-	-	-	-	-	Tonga
-	-	-	-	-	-	-	-	Tuvalu
-	-	-	-	-	-	-	-	Vanuatu
-	-	-	-	-	-	-	-	Wallis and Futuna Islands
								Total Oceania
-	-	-	-	-	-	-	-	Argentina
-	-	-	-	-	-	-	-	Bolivia
-	-	-	-	-	-	-	-	Brazil
-	-	-	-	-	-	-	-	Chile
-	-	-	-	-	-	-	-	Colombia
-	-	-	-	-	-	-	-	Ecuador
-	-	-	-	-	-	-	-	Falkland Islands
-	-	-	400	-	-	-	-	French Guiana
-	-	-	-	-	-	-	-	Guyana
-	-	-	-	-	-	-	-	Paraguay
-	-	-	-	-	-	-	-	Peru
-	-	-	-	-	-	-	-	South Georgia and the South Sandwich Islands
-	-	-	-	-	-	-	-	Suriname
-	-	-	-	-	-	-	-	Uruguay
-	-	-	-	-	-	-	-	Venezuela (Bolivarian Republic of)
								Total South America
								WORLD

TABLE 19

Value of wood and non-wood forest products removals 2005

Country/area	Value (1 000 US$)				Total value per ha (US$)
	Industrial roundwood	Fuelwood	NWFPs	Total	
Angola	-	-	-	-	-
Botswana	-	-	-	-	-
British Indian Ocean Territory	-	-	-	-	-
Comoros	1 600	2 338	366	4 304	790
Kenya	-	-	-	-	-
Lesotho	-	9 244	-	9 244	1 156
Madagascar	66 976	8 363	-	75 339	6
Malawi	-	-	-	-	-
Mauritius	137	7	26 149	26 293	711
Mayotte	-	-	-	-	-
Mozambique	-	-	-	-	-
Namibia[a]	-	-	-	-	-
Réunion	431	102	-	533	6
Seychelles	-	-	-	-	-
South Africa	338 500	1 500	-	340 000	37
Swaziland	-	-	-	-	-
Uganda	-	70	-	70	n.s.
United Republic of Tanzania	-	-	-	-	-
Zambia	-	-	-	-	-
Zimbabwe	59 047	-	-	59 047	3
Total Eastern and Southern Africa					
Algeria[a]	4 400	184	13 333	17 917	8
Burkina Faso[a]	-	94 033	-	94 033	14
Chad	-	47 229	-	47 229	4
Djibouti	-	-	-	-	-
Egypt	5 854	5 190	-	11 044	165
Eritrea	-	-	-	-	-
Ethiopia	74 552	641 734	36 583	752 869	58
Libyan Arab Jamahiriya	-	-	-	-	-
Mali	-	-	-	-	-
Mauritania	-	-	-	-	-
Morocco	22 694	2 830	-	25 524	6
Niger[a]	-	92 334	5 295	97 629	77
Somalia	-	-	-	-	-
Sudan	82 611	379 143	692 041	1 153 795	17
Tunisia	7 200	380	120 232	127 812	121
Western Sahara	583	-	-	583	1
Total Northern Africa					
Benin	-	-	-	-	-
Burundi	-	-	-	-	-
Cameroon	-	-	-	-	-
Cape Verde	-	-	-	-	-
Central African Republic	-	-	-	-	-
Congo	222 545	20 091	-	242 636	11
Côte d'Ivoire	298 577	-	-	298 577	29
Democratic Republic of the Congo	-	-	-	-	-

TABLE 19
Value of wood and non-wood forest products removals 2005

Country/area	Value (1 000 US$)				Total value per ha (US$)
	Industrial roundwood	Fuelwood	NWFPs	Total	
Equatorial Guinea	-	-	-	-	-
Gabon	-	-	-	-	-
Gambia	-	-	-	-	-
Ghana	31 265	-	-	31 265	6
Guinea	-	-	-	-	-
Guinea-Bissau	2 000	15 000	-	17 000	8
Liberia	-	-	-	-	-
Nigeria	1 527 288	475 429	-	2 002 718	181
Rwanda	1 318	33 977	-	35 295	74
Saint Helena	-	-	-	-	-
Sao Tome and Principe	-	-	-	-	-
Senegal	601	16 320	3 199	20 120	2
Sierra Leone	-	-	-	-	-
Togo	-	-	-	-	-
Total Western and Central Africa					
Total Africa					
China	4 946 290	-	-	4 946 290	25
Democratic People's Republic of Korea	81 525	32 925	-	114 450	18
Japan	2 864 500	-	34 506	2 899 006	117
Mongolia	67	247	-	314	n.s.
Republic of Korea	202 667	13 404	937 990	1 154 061	184
Total East Asia					
Bangladesh	21 253	2 321	199 757	223 331	256
Bhutan	6 383	21	27	6 431	2
Brunei Darussalam	3 160	2	-	3 162	11
Cambodia	-	-	21 586	21 586	2
India	208 644	8 023	179 132	395 799	6
Indonesia	2 159 679	-	-	2 159 679	24
Lao People's Democratic Republic	40 931	20 226	-	61 157	4
Malaysia	2 081 000	69 000	-	2 150 000	103
Maldives	-	-	-	-	-
Myanmar	838 479	51 415	11 761	901 655	28
Nepal	5 610	-	-	5 610	2
Pakistan	113 116	1 380 971	33 807	1 527 894	803
Philippines	60 272	722	-	60 994	9
Singapore	-	-	-	-	-
Sri Lanka	45 796	35 484	-	81 280	42
Thailand	46	13	-	59	n.s.
Timor-Leste	-	-	-	-	-
Viet Nam	91 579	77 788	289 507	458 874	35
Total South and Southeast Asia					
Afghanistan	53 720	98 406	15 483	167 609	193
Armenia	640	1 165	-	1 805	6
Azerbaijan	-	-	-	-	-

TABLE 19
Value of wood and non-wood forest products removals 2005

Country/area	Value (1 000 US$)				Total value per ha (US$)
	Industrial roundwood	Fuelwood	NWFPs	Total	
Bahrain	-	-	-	-	-
Cyprus	379	72	-	451	3
Georgia	-	-	-	-	-
Iran (Islamic Republic of)	117 482	184	551	118 217	11
Iraq	-	-	-	-	-
Israel	-	-	-	-	-
Jordan[a]	181	649	-	830	10
Kazakhstan	-	-	-	-	-
Kuwait	-	-	-	-	-
Kyrgyzstan	540	161	-	701	1
Lebanon	0	-	1 750	1 750	13
Occupied Palestinian Territory	-	-	-	-	-
Oman	-	-	2 600	2 600	1 300
Qatar	-	-	-	-	-
Saudi Arabia	0	0	1 960	1 960	1
Syrian Arab Republic	-	-	-	-	-
Tajikistan	0	32	70	102	n.s.
Turkey	421 651	326 443	550	748 644	74
Turkmenistan	0	12	-	12	n.s.
United Arab Emirates	0	0	0	0	0
Uzbekistan	211	57	74	342	n.s.
Yemen	-	-	-	-	-
Total Western and Central Asia					
Total Asia					
Albania	662	237	110 016	110 915	140
Andorra	-	-	-	-	-
Austria[a]	950 000	225 000	-	1 175 000	304
Belarus	22 700	4 000	29 605	56 305	7
Belgium	132 766	9 091	-	141 857	213
Bosnia and Herzegovina	-	-	-	-	-
Bulgaria	44 637	10 887	-	55 524	15
Channel Islands	-	-	-	-	-
Croatia	244 502	18 304	874	263 681	124
Czech Republic	1 191 268	14 672	202 370	1 408 310	532
Denmark	45 989	28 869	184 626	259 484	519
Estonia	268 576	19 601	4 802	292 979	128
Faeroe Islands	-	-	-	-	-
Finland	2 614 351	151 450	154 656	2 920 457	130
France	-	-	33 000	33 000	2
Germany	-	-	191 650	191 650	17
Gibraltar	-	-	-	-	-
Greece	-	-	-	-	-
Holy See	-	-	-	-	-
Hungary	213 061	150 141	-	363 202	184
Iceland	101	53	300	454	10
Ireland	82 677	277	-	82 954	124
Isle of Man	-	-	-	-	-

TABLE 19
Value of wood and non-wood forest products removals 2005

Country/area	Value (1 000 US$)				Total value per ha (US$)
	Industrial roundwood	Fuelwood	NWFPs	Total	
Italy	-	-	-	-	-
Latvia	-	-	-	-	-
Liechtenstein	-	-	-	-	-
Lithuania	191 633	17 377	2 059	211 069	101
Luxembourg	-	-	-	-	-
Malta	-	-	-	-	-
Monaco	-	-	-	-	-
Netherlands	29 460	6 873	15 180	51 513	141
Norway	316 882	40 930	144 201	502 013	53
Poland	833 344	29 957	21 739	885 040	96
Portugal	-	-	-	-	-
Republic of Moldova	-	-	-	-	-
Romania	422 120	-	-	422 120	66
Russian Federation	1 811 600	166 980	4 820	1 983 400	2
San Marino	-	-	-	-	-
Serbia and Montenegro	50 739	19 485	-	70 224	26
Slovakia	308 304	5 341	11 611	325 256	169
Slovenia	93 947	9 660	41 870	145 477	115
Spain	533 200	33 195	307 952	874 347	49
Sweden	2 824 280	149 480	203 800	3 177 560	115
Switzerland	287 809	39 762	37 375	364 946	299
The former Yugoslav Republic of Macedonia	-	-	-	-	-
Ukraine	-	-	380	380	n.s.
United Kingdom	343 000	7 000	101 733	451 733	159
Total Europe					
Anguilla	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-
Aruba	-	-	-	-	-
Bahamas	-	-	-	-	-
Barbados	-	-	-	-	-
Bermuda	-	-	-	-	-
British Virgin Islands	-	-	-	-	-
Cayman Islands	-	-	-	-	-
Cuba	233 240	13 350	1 244	247 834	91
Dominica	-	-	-	-	-
Dominican Republic	-	-	-	-	-
Grenada	-	-	-	-	-
Guadeloupe	-	-	-	-	-
Haiti	-	-	-	-	-
Jamaica[a]	55	-	-	55	n.s.
Martinique	-	-	-	-	-
Montserrat	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-
Puerto Rico	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-
Saint Lucia	-	-	-	-	-

TABLE 19
Value of wood and non-wood forest products removals 2005

Country/area	Value (1 000 US$)				Total value per ha (US$)
	Industrial roundwood	Fuelwood	NWFPs	Total	
Saint Vincent and the Grenadines	-	-	-	-	-
Trinidad and Tobago	6 872	-	-	6 872	30
Turks and Caicos Islands	-	-	-	-	-
United States Virgin Islands	-	-	-	-	-
Total Caribbean					
Belize	-	-	-	-	-
Costa Rica	122 122	-	-	122 122	51
El Salvador	-	-	-	-	-
Guatemala	37 709	159 110	-	196 819	50
Honduras	18 132	40 642	4 117	62 891	14
Nicaragua	8 480	34 800	-	43 280	8
Panama	3 862	2 729	-	6 591	2
Total Central America					
Canada[a]	-	-	-	-	-
Greenland	-	-	-	-	-
Mexico	545 479	19 216	32 134	596 829	9
Saint Pierre and Miquelon	-	-	-	-	-
United States of America	18 682 708	309 226	34 200	19 026 134	63
Total North America					
Total North and Central America					
American Samoa	-	-	-	-	-
Australia	1 178 600	-	-	1 178 600	7
Cook Islands	-	-	350	350	23
Fiji	6 655	5	-	6 661	7
French Polynesia	-	-	-	-	-
Guam	-	-	-	-	-
Kiribati	-	-	-	-	-
Marshall Islands	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-
Nauru	-	-	-	-	-
New Caledonia	-	-	-	-	-
New Zealand	647 179	-	18 240	665 419	80
Niue	-	-	-	-	-
Northern Mariana Islands	-	-	-	-	-
Palau	-	-	-	-	-
Papua New Guinea	6 330	-	-	6 330	n.s.
Pitcairn	-	-	-	-	-
Samoa	32	-	-	32	n.s.
Solomon Islands	-	-	-	-	-
Tokelau	-	-	-	-	-
Tonga	-	-	-	-	-
Tuvalu	-	-	-	-	-
Vanuatu	-	-	-	-	-
Wallis and Futuna Islands	-	-	-	-	-
Total Oceania					

TABLE 19

Value of wood and non-wood forest products removals 2005

Country/area	Value *(1 000 US$)*				Total value per ha *(US$)*
	Industrial roundwood	Fuelwood	NWFPs	Total	
Argentina	117 616	26 115	-	143 731	4
Bolivia	49 220	321	-	49 541	1
Brazil	2 897 019	942 020	193 131	4 032 170	8
Chile	758 289	92 874	-	851 163	53
Colombia	-	-	-	-	-
Ecuador	93 193	45 785	-	138 978	13
Falkland Islands	-	-	-	-	-
French Guiana	2 716	-	4 099	6 815	1
Guyana	-	-	-	-	-
Paraguay	252 680	225 746	-	478 426	26
Peru	4 409	-	-	4 409	n.s.
South Georgia and the South Sandwich Islands	-	-	-	-	-
Suriname	15 000	60	-	15 060	1
Uruguay	47 400	13 920	-	61 320	41
Venezuela (Bolivarian Republic of)	43 856	-	-	43 856	1
Total South America					
WORLD					

[a] The country provided information for this table for forest and other wooded land combined. For the purposes of data display and analysis, FAO has assigned these values to the forest category.

TABLE 20

Employment in forestry[a] 1990 and 2000 *(1 000 person-years)*

Country/area	1990	2000			
	Total	Total	Production	Provision of services	Unspecified
Angola	1	-	-	-	-
Botswana	-	-	-	-	-
British Indian Ocean Territory	-	-	-	-	-
Comoros	14	17	17	-	-
Kenya	2	2	2	-	-
Lesotho	n.s.	n.s.	n.s.	-	-
Madagascar	-	47	47	-	-
Malawi	1	1	1	-	-
Mauritius	3	3	2	1	-
Mayotte	-	-	-	-	-
Mozambique	8	12	12	-	-
Namibia	-	-	-	-	-
Réunion	-	1	n.s.	1	-
Seychelles	-	-	-	-	-
South Africa	-	321	66	255	-
Swaziland	-	-	-	-	-
Uganda	1	2	2	-	-
United Republic of Tanzania	4	4	4	-	-
Zambia	-	-	-	-	-
Zimbabwe	14	16	16	-	-
Total Eastern and Southern Africa					
Algeria	-	29	22	7	-
Burkina Faso	-	6	2	4	-
Chad	1	1	n.s.	1	-
Djibouti	-	-	-	-	-
Egypt	-	10	-	-	10
Eritrea	-	-	-	-	-
Ethiopia	-	-	-	-	-
Libyan Arab Jamahiriya	-	-	-	-	-
Mali	-	-	-	-	-
Mauritania	-	-	-	-	-
Morocco	12	12	12	-	-
Niger	2	8	4	4	-
Somalia	n.s.	n.s.	-	-	n.s.
Sudan	5	5	5	-	-
Tunisia	30	40	36	3	-
Western Sahara	-	-	-	-	-
Total Northern Africa					
Benin	-	-	-	-	-
Burundi	-	-	-	-	-
Cameroon	23	20	-	-	20
Cape Verde	-	n.s.	-	n.s.	-
Central African Republic	-	-	-	-	-
Congo	7	10	10	n.s.	-
Côte d'Ivoire	-	34	32	2	-
Democratic Republic of the Congo	-	-	-	-	-

TABLE 20

Employment in forestry[a] 1990 and 2000 *(1 000 person-years)*

Country/area	1990	2000			
	Total	Total	Production	Provision of services	Unspecified
Equatorial Guinea	1	2	2	-	-
Gabon	4	4	4	-	-
Gambia	n.s.	n.s.	n.s.	-	-
Ghana	10	7	7	-	-
Guinea	-	-	-	-	-
Guinea-Bissau	29	56	1	25	30
Liberia	5	2	2	-	-
Nigeria	10	11	10	1	-
Rwanda	-	1	n.s.	1	0
Saint Helena	-	-	-	-	-
Sao Tome and Principe	-	-	-	-	-
Senegal	10	13	12	n.s.	-
Sierra Leone	-	n.s.	n.s.	n.s.	-
Togo	106	176	135	1	40
Total Western and Central Africa					
Total Africa					
China	2 515	2 017	1 499	26	492
Democratic People's Republic of Korea	4	22	19	3	0
Japan	108	63	63	-	-
Mongolia	-	-	-	-	-
Republic of Korea	20	20	12	1	8
Total East Asia					
Bangladesh	98	98	78	20	-
Bhutan	2	4	4	n.s.	0
Brunei Darussalam	1	1	1	n.s.	-
Cambodia	19	17	16	n.s.	-
India	5 465	4 855	1 976	2 879	-
Indonesia	-	162	159	3	-
Lao People's Democratic Republic	3	4	4	n.s.	-
Malaysia	78	67	66	2	-
Maldives	-	-	-	-	-
Myanmar	111	101	101	n.s.	-
Nepal	145	110	96	14	-
Pakistan	33	30	27	3	-
Philippines	-	-	-	-	-
Singapore	n.s.	n.s.	0	n.s.	0
Sri Lanka	4	6	5	1	-
Thailand	16	16	7	9	-
Timor-Leste	n.s.	n.s.	n.s.	-	-
Viet Nam	16	210	194	16	-
Total South and Southeast Asia					
Afghanistan	-	-	-	-	-
Armenia	2	2	n.s.	1	n.s.
Azerbaijan	5	3	-	-	3

TABLE 20

Employment in forestry[a] 1990 and 2000 *(1 000 person-years)*

Country/area	1990	2000			
	Total	Total	Production	Provision of services	Unspecified
Bahrain	-	-	-	-	-
Cyprus	1	1	n.s.	0	1
Georgia	12	7	-	-	7
Iran (Islamic Republic of)	84	107	86	9	12
Iraq	-	-	-	-	-
Israel	2	4	3	1	-
Jordan	1	2	-	-	2
Kazakhstan	-	-	-	-	-
Kuwait	-	-	-	-	-
Kyrgyzstan	6	4	-	-	4
Lebanon	-	n.s.	-	n.s.	-
Occupied Palestinian Territory	-	-	-	-	-
Oman	-	-	-	-	-
Qatar	-	-	-	-	-
Saudi Arabia	1	1	0	1	0
Syrian Arab Republic	12	16	1	13	2
Tajikistan	5	5	0	3	2
Turkey	367	343	-	-	343
Turkmenistan	-	2	2	0	0
United Arab Emirates	-	-	-	-	-
Uzbekistan	5	7	7	0	0
Yemen	-	-	-	-	-
Total Western and Central Asia					
Total Asia					
Albania	8	2	n.s.	1	n.s.
Andorra	-	-	-	-	-
Austria	10	8	6	1	-
Belarus	-	44	44	0	0
Belgium	4	4	3	-	1
Bosnia and Herzegovina	22	12	10	2	0
Bulgaria	-	69	33	1	34
Channel Islands	-	-	-	-	-
Croatia	14	10	10	-	-
Czech Republic	52	31	19	12	0
Denmark	4	4	4	1	0
Estonia	11	9	-	-	9
Faeroe Islands	-	-	-	-	-
Finland	39	24	-	-	24
France	33	35	-	-	35
Germany	-	70	-	-	70
Gibraltar	-	-	-	-	-
Greece	-	-	-	-	-
Holy See	-	-	-	-	-
Hungary	46	12	-	-	12
Iceland	n.s.	n.s.	-	-	n.s.
Ireland	3	4	4	-	-
Isle of Man	-	-	-	-	-

TABLE 20

Employment in forestry[a] 1990 and 2000 *(1 000 person-years)*

Country/area	1990	2000			
	Total	Total	Production	Provision of services	Unspecified
Italy	56	36	36	-	-
Latvia	15	19	-	-	19
Liechtenstein	-	-	-	-	-
Lithuania	15	14	-	-	14
Luxembourg	-	-	-	-	-
Malta	-	-	-	-	-
Monaco	-	-	-	-	-
Netherlands	2	2	2	-	1
Norway	7	5	-	-	5
Poland	134	60	-	-	60
Portugal	16	11	11	-	-
Republic of Moldova	5	3	3	-	-
Romania	89	47	-	-	47
Russian Federation	187	196	155	42	-
San Marino	-	-	-	-	-
Serbia and Montenegro	15	10	8	-	2
Slovakia	36	27	24	2	1
Slovenia	6	3	-	-	3
Spain	36	29	29	-	-
Sweden	34	17	-	-	17
Switzerland	9	7	7	-	-
The former Yugoslav Republic of Macedonia	4	3	-	-	3
Ukraine	62	105	-	-	105
United Kingdom	19	12	4	1	7
Total Europe					
Anguilla	-	-	-	-	-
Antigua and Barbuda	-	-	-	-	-
Aruba	-	-	-	-	-
Bahamas	-	-	-	-	-
Barbados	-	n.s.	n.s.	-	-
Bermuda	-	-	-	-	-
British Virgin Islands	-	-	-	-	-
Cayman Islands	-	-	-	-	-
Cuba	29	37	-	-	37
Dominica	-	-	-	-	-
Dominican Republic	n.s.	n.s.	n.s.	-	-
Grenada	n.s.	n.s.	-	-	n.s.
Guadeloupe	-	-	-	-	-
Haiti	-	-	-	-	-
Jamaica	n.s.	1	1	n.s.	-
Martinique	n.s.	n.s.	-	-	n.s.
Montserrat	-	-	-	-	-
Netherlands Antilles	-	-	-	-	-
Puerto Rico	-	-	-	-	-
Saint Kitts and Nevis	-	-	-	-	-
Saint Lucia	-	-	-	-	-

TABLE 20

Employment in forestry[a] 1990 and 2000 *(1 000 person-years)*

Country/area	1990	2000			
	Total	Total	Production	Provision of services	Unspecified
Saint Vincent and the Grenadines	-	-	-	-	-
Trinidad and Tobago	1	1	1	-	-
Turks and Caicos Islands	-	-	-	-	-
United States Virgin Islands	-	-	-	-	-
Total Caribbean					
Belize	1	n.s.	-	n.s.	-
Costa Rica	-	7	7	-	n.s.
El Salvador	-	-	-	-	-
Guatemala	-	82	-	-	82
Honduras	32	63	57	-	6
Nicaragua	17	35	30	5	-
Panama	3	8	8	-	-
Total Central America					
Canada	74	89	89	-	-
Greenland	-	-	-	-	-
Mexico	-	-	-	-	-
Saint Pierre and Miquelon	0	0	0	0	0
United States of America	311	281	221	50	10
Total North America					
Total North and Central America					
American Samoa	-	-	-	-	-
Australia	15	17	13	4	-
Cook Islands	-	-	-	-	-
Fiji	n.s.	n.s.	n.s.	-	-
French Polynesia	-	-	-	-	-
Guam	-	-	-	-	-
Kiribati	-	-	-	-	-
Marshall Islands	-	-	-	-	-
Micronesia (Federated States of)	-	-	-	-	-
Nauru	-	-	-	-	-
New Caledonia	n.s.	n.s.	n.s.	-	n.s.
New Zealand	6	9	6	-	3
Niue	-	-	-	-	-
Northern Mariana Islands	-	-	-	-	-
Palau	-	-	-	-	-
Papua New Guinea	13	11	8	1	2
Pitcairn	-	-	-	-	-
Samoa	1	n.s.	n.s.	n.s.	-
Solomon Islands	-	-	-	-	-
Tokelau	-	-	-	-	-
Tonga	-	-	-	-	-
Tuvalu	-	-	-	-	-
Vanuatu	-	-	-	-	-
Wallis and Futuna Islands	-	-	-	-	-
Total Oceania					

TABLE 20

Employment in forestry[a] 1990 and 2000 *(1 000 person-years)*

Country/area	1990	2000			
	Total	Total	Production	Provision of services	Unspecified
Argentina	1	33	32	1	-
Bolivia	-	23	14	-	9
Brazil	-	-	-	-	-
Chile	52	54	40	13	-
Colombia	-	-	-	-	-
Ecuador	-	n.s.	n.s.	-	n.s.
Falkland Islands	-	-	-	-	-
French Guiana	n.s.	n.s.	n.s.	n.s.	n.s.
Guyana	-	-	-	-	-
Paraguay	11	7	4	3	-
Peru	-	120	117	3	-
South Georgia and the South Sandwich Islands	-	-	-	-	-
Suriname	1	n.s.	n.s.	n.s.	-
Uruguay	1	6	6	-	-
Venezuela (Bolivarian Republic of)	-	2	2	-	-
Total South America					
WORLD					

[a] Refers to employment related to the primary production of goods, provision of services and unspecified forestry activities (excluding the wood processing industry). Employment is defined as "any type of work performed or services rendered under a contract of hire, written or oral, in exchange for wage or salary, in cash or in kind", and thus excludes informal employment.

Annex 4
FRA 2005 working papers

The key findings of FRA 2005, the country reports and all relevant background documents are available on the FAO Web site at www.fao.org/forestry/fra2005.

A complete list of all working papers prepared by the FRA programme can be found at www.fao.org/forestry/site/2560/en.

This annex lists those FRA working papers directly related to FRA 2005 excluding the list of country reports. Paper copies can be requested by e-mail to fra@fao.org, or by ordinary mail to FAO, Forestry Department, FRA Programme, Viale delle Terme di Caracalla, 00100 Rome, Italy.

E, F, S, A and R refer to the languages English, French, Spanish, Arabic and Russian.

Number	Title
80	Proc. training of national correspondents on assessing and monitoring of forest land use and changes, 17–21 November 2003, Rome, Italy (E, F, S)
81	Specification of national reporting tables for FRA 2005 (E, F, S, A, R)
82	Guidelines for country reporting to FRA 2005 (E, F, S, A, R)
83	Terms and definitions (final version) (E, F, S, A, R)
84	Proc. regional training of national correspondents on country reporting to FRA 2005, 26–28 May 2004, Yokohama, Japan (E)
85	Compte-rendu atelier révision au niveau régional des rapports nationaux des pays d'Afrique francophone, 20–23 juillet 2004, Dakar, Sénégal (F)
86	Proc. subregional workshop for national correspondents from anglophone African countries, 27–30 July 2004, Accra, Ghana (E)
87	Acta reunión regional de corresponsales nacionales de habla hispana de América Latina y el Caribe, 2–11 de septiembre 2004, Ciudad de Guatemala, Guatemala (S)
88	Proc. subregional workshop for national correspondents from south and southeastern Europe, 27–29 October 2004, Budapest, Hungary (E)
89	Proc. regional review of national reports for Asian and Pacific countries, 23–26 November 2004, Bangkok, Thailand (E)
90	Proc. subregional workshop for Russian-speaking national correspondents to FRA, 7–11 December 2004, Wyszków, Poland (E)
91	Proc. regional review of national reports for English-speaking Caribbean countries, 24–28 February 2005, Kingston, Jamaica (E)
102	FRA 2000 and FRA 2005: comparing estimates of forest area and forest area change (E)
103	Methodology of information generation and management for FRA 2005 (E)
104	Documentation of calculations to determine progress towards sustainable forest management in the FRA 2005 main report (E)
105	FRA 2005: lessons learned and suggestions for future assessments (E)
106	FRA 2005: global assessments of growing stock, biomass and carbon stock (E)

ANNEX 5

FRA 2005 meetings and workshops

Venue and date	Name of meeting
Kotka, Finland 1–5 July 2002	Kotka IV: expert consultation on global forest resources assessment – linking national and international efforts. Organized by FAO, UNEP and UNECE. www.fao.org/forestry/site/2421/en
Nairobi, Kenya 16–18 October 2002	First meeting of the advisory group on global forest resources assessment www.fao.org/forestry/site/5768/en
Rome, Italy 13–15 March 2003	Second meeting of the advisory group on global forest resources assessment www.fao.org/forestry/site/11827/en
Rome, Italy 17–21 November 2003	Global training of national correspondents on assessing and monitoring of forest land use and changes www.fao.org/forestry/site/12708/en
Rome, Italy 22 November 2003	Third meeting of the advisory group on global forest resources assessment www.fao.org/forestry/site/21310/en
Beirut, Lebanon 21–22 May 2004	Near East regional workshop on global forest resources assessment – FRA 2005 www.fao.org/forestry/site/19480/en
Yokohama, Japan 26–28 May 2004	Regional training of national correspondents in East Asia on country reporting to FRA 2005 ww.fao.org/forestry/site/19476/en
Dakar, Senegal 20–23 July 2004	Révision au niveau régional des rapports nationaux des pays d'Afrique francophone www.fao.org/forestry/site/19475/fr (French only)
Accra, Ghana 27–30 July 2004	Subregional workshop for national correspondents from anglophone African countries www.fao.org/forestry/site/24408/en
Ciudad de Guatemala, Guatemala 2–11 September 2004	Reunión regional de corresponsales nacionales de habla hispana de América Latina y el Caribe www.fao.org/forestry/site/19479/sp (Spanish only)
Washington, DC, USA 15–17 September 2004	Tenth meeting of the UNECE team of specialists on forest resources assessment www.unece.org/trade/timber/docs/fra-tos/2004/tos-fra-04.htm
Budapest, Hungary 27–29 October 2004	Subregional workshop for national correspondents from south and southeastern Europe www.fao.org/forestry/site/33107/en

Bangkok, Thailand 23–26 November 2004	Regional workshop for national correspondents from Asia and the Pacific www.fao.org/forestry/site/33207/en
Wyszków, Poland 7–11 December 2004	Subregional workshop for Russian-speaking FRA national correspondents www.fao.org/forestry/site/33108/en
Rome, Italy 14–15 January 2005	Fourth meeting of the advisory group on global forest resources assessment ww.fao.org/forestry/site/33048/en
Kingston, Jamaica 24–28 January 2005	Regional review of national reports for English-speaking Caribbean countries www.fao.org/forestry/site/19477/en
Rome, Italy 17–18 January 2006	Fifth meeting of the advisory group on global forest resources assessment www.fao.org/forestry/site/33148/en

Annex 6
Earlier global assessments

FAO was founded on 16 October 1945. At the first session of the Conference of FAO, the need for up-to-date information on the forest resources of the world was highlighted. This reflected concern for a possible future lack of timber, not least due to the needs for reconstruction after the Second World War and for support to development in tropical countries. It was recommended, therefore, that a global forest resources inventory should be undertaken as soon as possible. In May 1946, the Forestry and Forest Products Division was founded and work initiated on FAO's first worldwide assessment of forests, published two years later (FAO, 1948). After reviewing the results of this assessment, the sixth session of the FAO Conference recommended that the Organization "maintain a permanent capability to provide information on the state of forest resources worldwide on a continuing basis" (FAO, 1951). Since that time, regional and global surveys have been conducted every five to ten years. Each has taken a somewhat different form.

Statistics released by FAO on world forest area from 1948 through 1963 were largely collected through questionnaires sent to the countries. The assessments since 1980 have taken a more solid technical form, being based on analysis of country references supported by expert judgements, remote sensing and statistical modelling.

FRA 2000 was the most comprehensive past assessment in terms of the number of references used and information analysed on forest area, the condition of forests and their management, forest services and NWFPs. FRA 2000 was also notable for applying, for the first time, a single definition of forest at the global level with common minimum thresholds, including a 10 percent crown cover density.

Statistics from the different assessments do not lend themselves to comparative analysis, owing to changes in baseline information, methods and definitions. However, better correlations can be achieved for time series in many countries for certain assessments, especially with information generated since 1980. Consistent definitions of forests were applied for developing countries for subsequent assessments – and for all countries as of FRA 2000.

FAO'S GLOBAL AND REGIONAL ASSESSMENTS 1946–2001

Forest resources of the world (1948)

For the first global survey, *Forest resources of the world* (FAO, 1948), a questionnaire was sent to all countries, with 101 responding, which represented about 66 percent of the world's forests. Parameters included were forest area (total and productive), types of forest by accessibility of wood resources, growth and fellings.

One of the noteworthy conclusions of the first report was that:

"All these investigations made valuable additions to our knowledge, but all suffered from certain fundamental difficulties. Most important of these were the lack of reliable forest inventory information … and the lack of commonly accepted definitions of some of the more important forestry terms. Hence, to the weakness of some of the quantitative estimates, there was added doubt as to the real meanings of some of the qualitative descriptions".

This statement remains largely true today, almost 60 years later. While technical and scientific advances have greatly increased the potential to improve the information base in countries, many still lack the training, institutional and financial resources to conduct periodic assessments.

Major findings on forest area and forest area change

- Total forest area (global): 4.0 billion hectares
- Net forest change (global): not reported

World forest inventories (1953, 1958 and 1963)

World forest inventories were carried out on three occasions during the 1950s and 1960s. Lanly (1983) describes these various inventories:

> *... 126 countries and territories replied to the 1953 questionnaire representing about 73 percent of the world forest area. The picture was completed by information from the replies to the 1947 questionnaire for 10 other countries (representing 3 percent of the total world forested area) and official statistics for the remaining 57 countries, representing 24 percent of the world forest area. The results were published by FAO in 1955 under the title World forest resources – results of the inventory undertaken in 1953 by the Forestry Division of FAO.*
>
> *The 1958 inventory … (World Forest Inventory 1958 – the third in the quinquennial series compiled by the Forestry and Forest Products Division of FAO)* [FAO, 1960] *utilized the replies of the 143 countries or territories, representing 88 percent of the world forest area, complemented by the replies to the 1953 questionnaire for 13 countries (2 percent) and to the 1947 questionnaire for 5 countries (3 percent). Necessary changes and precisions introduced in the definition of some concepts, more precise definitions of forests and changes in such concepts as forest-in-use and accessible forests affected comparability with the previous inventories. However, changes in area and other forest characteristics during the 1953-58 period were, for several countries, either reported directly from them or could be derived by comparison of the replies to both questionnaires (changes in area of permanent forests, in management status ... increase in accessible areas and in forest-in-use, afforested area between 1953 and 1957, etc.).*
>
> *The World Forest Inventory 1963 published by FAO in 1965 witnessed a slightly lower rate of response (105 compared to 130), "at least partly accounted for by temporary strains on administration in countries gaining their independence" as was reported in the document. Again comparability with the former enquiries was limited, and, as pointed out by the authors of the report, "large differences for some countries (between the results of the 1958 and 1963 enquiries) resulted more from better knowledge about the forests, or stricter application of definitions, than from effective changes in the forest resources".*

The main parameters assessed during the *World forest inventory 1963* were forest area (total, productive and protected), ownership, management status, composition (softwoods and hardwoods), growing stock and removals (FAO, 1966).

Major findings on forest area and forest area change (1963)

- Total forest area (global): 3.8 billion hectares
- Net forest change: not reported

Regional forest resources assessments (1970s)

During the 1970s, FAO did not carry out global surveys. Instead, a series of regional assessments were conducted, with the intention that each would be more appropriate and specific to the regions. Beginning in the late 1960s, FAO sent out questionnaires to all industrialized countries. The results were published in 1976 as *Forest resources in the European Region* (FAO, 1976b). Questionnaires were also sent to Asia and Latin America, and the results were published in *Forest resources in the Asia and Far East Region* (FAO, 1976c) and *Appraisal of forest resources of the Latin American Region* (FAO, 1976a). A similar questionnaire was sent to African countries by the Department of Forest Survey of the Swedish Royal College of Forestry and the results published in

Forest resources of Africa – an approach to international forest resources appraisal, Part I: *country descriptions* (Persson, 1975) and Part II: *Regional analyses* (Persson, 1977).

According to Lanly (1983), the regional assessments of the developing countries had the following main features in common:

- they were based only in part upon questionnaires, the rest of the information having been collected in another form, in particular through travel to countries of the region concerned;
- they included more qualitative information (description of forest types, indication of species planted, quotation of figures on volumes and other stand characteristics extracted from inventory reports, etc.), while the World Forest Inventory assessments were essentially statistical;
- in addition to regional statistical tables, country notes were prepared regrouping the quantitative information selected for each country;
- since the information provided was not limited to the replies to the questionnaires, the draft country notes were sent back to the national forest institutions for their comments and suggested amendments.

Although FAO did not compile the regional findings into a global synthesis, a global survey was done outside FAO and published in *World forest resources – review of the world's forest resources in the early 1970s* (Persson, 1974). Another FAO study, Attempt at an assessment of the world's tropical moist forests (Sommer, 1976), provided a summary of findings on the forest situation in all tropical moist forests.

FRA 1980

FRA 1980 covered 97 percent of the land area of developing countries or 76 tropical countries: 37 in Africa, 16 in Asia and 23 in Latin America and the Caribbean. FRA 1980 was distinguished by many features. Its breadth was the greatest up to that time, and in many cases remains unmatched by more recent assessments. It is also notable as the first assessment to use a definition of forests in which measurable parameters were indicated – 10 percent canopy cover density, minimum tree height of 7 m and 10 ha as the minimum area. Previous assessments had relatively broad definitions, which could be interpreted quite differently by different countries. This consistent definition provided parameters useful in adjusting country information to a common standard. An adjustment in time was also made, using expert opinion to project the information to common reference years of 1976, 1980, 1981 and 1985.

FRA 1980 relied extensively on existing documentation from countries to formulate its estimates of forest area (status and change), plantation resources and wood volume. Existing information from multiple sources in the countries was gathered and analysed. Dialogues with national and international experts on information utility and reliability helped to firm up country estimates. The assessment noted that information was abundant, but that it was hard to locate and synthesize in the coherent manner needed for a consistent global survey.

Extended narratives, explanatory text and qualitative information complemented the statistical data set. During the tenure of FRA 1980, FAO was conducting extensive work on forest inventories in tropical countries. Roughly one project existed for every two to three countries, and FAO experts in the projects provided valuable input to the 1980 assessment results.

In major forested areas for which existing information was lacking, the assessment conducted manual interpretations of satellite imagery (1:1 000 000 scale). This was done for six Latin American countries, two African countries, two Asian countries and portions of two other Asian countries. The interpretations covered about 70–99 percent of these countries, using 55 satellite images.

The final documentation for FRA 1980 included three volumes of country briefs (one for each developing country region) (FAO, 1981a, b and c), three regional

summaries and a condensed main report, published as an FAO Forestry Paper (FAO, 1982). While the findings were not global, FRA 1980 was used again in 1988 to make an interim global assessment.

Major findings on forest area and forest area change

- Total forest area (tropical developing countries only) 1980: 2.1 billion hectares (natural forests and plantations)
- Net forest change (tropical developing countries only) 1981–1985: -10.2 million hectares per year
- Net forest change (global): not reported

Interim assessment 1988

The *Interim report on the state of forest resources in the developing countries* (FAO, 1988) provided information on 129 developing countries (53 more than FRA 1980) as well as on industrialized countries. The report provided information on the state of forests in the year 1980 and changes over the period 1981–1985. Definitions varied between the industrialized and developing countries specifically for crown cover thresholds for forests, which were set at 20 percent for industrialized countries and 10 percent for developing ones. Information on the industrialized countries was collected by UNECE in Geneva, which drew on the report *Forest resources of the ECE region (Europe, the USSR, North America)* (UNECE and FAO, 1985). Parameters varied as well for the two groups of countries. Thus a global synthesis of core elements was needed in order to achieve a uniform global data set.

Elements of the global synthesis included forest, operable forest, inoperable forest, other wooded land, broad-leaved forest and coniferous forest.

Major findings on forest area and forest area change

- Total forest area (global) 1980: 3.6 billion hectares
- Net forest change (tropical developing countries) 1981–1985: -11.4 million hectares per year
- Net forest change (global): not reported

FRA 1990

FRA 1990 (FAO, 1993) covered all developing and industrialized countries and was distinguished by two innovations: the development and use of a computerized 'deforestation model', which was applied to the developing country data in order to project forest area statistics to a common reference year; and an independent, pan-tropical remote sensing survey of forest change based on high-resolution remote sensing data.

FRA 1990 sought to improve estimates by eliminating the bias in expert opinions through a statistical model for predicting forest area loss (and thus deforestation rates). The model was based on forest area change derived from the few comparable multi-date assessments available. Deforestation rates were then regressed against independent variables to determine the rate of forest loss relative to changes in population densities within specific ecological zones. Forest area change rates were obtained by applying the model to available baseline statistics for the countries.

The advantages of the 1990 method were the near-uniformity achieved by applying the model equally to almost all developing countries and the ability to streamline the production of statistics using computer routines.[1] The disadvantages of the 1990 method were the low number of variables used in the deforestation algorithm and the

[1] Two different models were used – one for the tropics and one for subtropical areas. Other differences among countries consisted in the lack of: baseline data in some countries, a uniform ecological map and comparable multi-date observations.

low number of observations used to construct the model, introducing a relatively high random error (i.e. low precision) in country estimates.

Because of the many uncertainties involved in working with existing national data, FRA 1990 implemented a remote sensing survey to provide a quality-controlled set of statistics on forest resources. The use of statistical sampling combined with a uniform data source (satellite imagery) and standard data-collection methods were important tools in providing a set of statistics to compare with the country data.

The survey relied on statistical sampling (10 percent) of the world's tropical forests through 117 sample units distributed throughout the tropics. Based on the sampling, estimates were produced of the status of and changes in tropical forests at regional, ecological and pan-tropical levels (but not at the national level). Each of the sample units consisted of multi-date, Landsat satellite images, which provided the raw material for producing statistics on forest and other land cover changes from 1980 to 1990.

FAO used an interdependent, manual interpretation of satellite scenes at a scale of 1:250 000, conducted by local professionals, where possible, and internationally experienced professionals in other areas. Multi-date image interpretations were manually compared to one another. Ground information was incorporated into about 50 percent of the interpretations. In some areas, ground truthing was not necessary, owing to the large and consistent amount of forest. In other locations, especially where the composition of the landscape was highly differentiated, it was found to be very valuable.

The principal output of the remote sensing survey was a change matrix that illustrated and quantified how the forest and landscape change over time. The forest and land cover classification scheme of the remote sensing survey was linked closely to the FRA classes for global reporting by countries.

Different definitions of forests for developing and industrialized countries limited the utility of the final global synthesis, as did the absence of change information on forests in industrialized countries. Only changes in the area of forest, combined with other wooded land, were assessed (the definition of forest was again set at 20 percent crown cover density for industrialized countries and 10 percent for developing countries).

The assessment covered the parameters of volume, biomass, annual harvesting (tropics) and plantations. Brief summaries were also prepared on conservation, forest management and biological diversity. Unfortunately, the country briefs prominent in FRA 1980 were discontinued.

Major findings on forest area and forest area change

- Total forest area (global) 1990: 3.4 billion hectares
- Net forest change (tropical developing countries) 1980–1990: -13.6 million hectares per year
- Net forest change (global) 1980–1990: -9.9 million hectares per year (forest and other wooded land combined)

Interim 1995 assessment

An interim 1995 assessment was published in *State of the World's Forests 1997* (FAO, 1997b). This report published new statistics on forest area status and change for all countries with a reference year of 1995, and a change interval from 1991–1995. The definition of forest set canopy closure thresholds at 20 percent for industrialized countries and 10 percent for developing countries.

The baseline information set was drawn, with a minimum of updating, from FRA 1990 data and had an average reference year of 1983. Although FAO contacted all developing countries and requested their latest inventory reports, updated information was submitted and used only for Brazil, Bolivia, Cambodia, Côte d'Ivoire, Guinea-Bissau, Mexico, Papua New Guinea, the Philippines and Sierra Leone.

The FRA 1990 deforestation model was used to adjust developing country statistics to standard reference years (1991 and 1995). No adjustments to standard reference years were made for industrialized country statistics. Consequently, the industrialized and developing country data were not harmonized in terms of their definitions or reference year.

Major findings on forest area and forest area change

- Total forest area (global) 1995: 3.4 billion hectares
- Net forest change (tropical developing countries) 1990–1995: -12.7 million hectares per year
- Net forest change (global): -11.3 million hectares per year (total forests)

FRA 2000

FRA 2000 improved on previous assessments in several ways. It covered more countries and parameters and used a single global definition of forest. The average national inventory year for information was closer to the global reporting year than in previous assessments. More support than in the past was given to country capacity-building, and new technologies, such as remote sensing, were used extensively. Reliability of the results was thus greatly enhanced, but there were still many information gaps.
In FRA 2000, a uniform definition of forest – 10 percent canopy cover – was used for all regions of the world. Revised estimates were made for the area of temperate and boreal forests in 1990 using the definition and methodology adopted in 2000.

An independent remote sensing survey used the same 117 sample units used in FRA 1990 and added recent Landsat satellite images, which made the production of statistics possible on forest and other land cover changes from 1980 to 2000. The resulting change matrix illustrated and quantified changes in the forest and landscape over time. The survey showed different patterns among regions within the tropics, which may have reflected general land-use patterns and policies. In Latin America, large-scale, direct conversion of forests dominated. Direct conversions also dominated in Africa, but on a smaller scale. In Asia, the area of gradual conversions (intensification of shifting agriculture) was equal to the direct conversions from forests to other land uses. At the global level, direct conversions dominated the picture, accounting for about three-quarters of the converted area. Most tropical deforestation was thus a result of rapid, planned or large-scale conversion to other land uses, mainly agriculture.

Efforts were made to increase the transparency and availability of background information. Many working papers were published in order to provide details on key countries and topics. Statistics, together with their underlying analyses and assumptions, were published on the FAO website. Countries were officially requested to confirm their key statistics before publication. As a follow-up, a dedicated issue of *Unasylva* (FAO, 2002c) reviewed forest resources assessment processes at global and national levels. The Kotka IV expert consultation in 2002 also reviewed the FRA 2000 process and results (Luhtala and Varjo, 2003).

Major findings on forest area and forest area change

- Total forest area (global) 2000: Nearly 3.9 billion hectares, of which 95 percent was natural forest and 5 percent forest plantations
  Net forest change (global) 1990–2000: -9.4 million hectares per year (forest)
  Global deforestation 1990–2000: 14.6 million hectares. Global increase in forest area due to afforestation and natural expansion of forests during the same period: average of 5.2 million hectares per year
  Net forest change (tropical countries) 1990–2000: -12.3 million hectares per year
- Net forest change (non-tropical countries) 1990–2000: 2.9 million hectares per year